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Official Journal American Congress of Physical Medicine

(Formerly Archives of Physical Therapy)

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ANNUAL SESSION, NEW YORK CITY, AUGUST 25-29, 1952

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VOLUME XXXIII JUNE, 1952 NO. 6

American Congress of Physical Medicine

30th Annual

Scientific and Clinical Session

and

Instruction Seminar

August 25, 26, 27, 28, 29, 1952

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THE ROOSEVELT

New York, New York

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INSTRUCTION SEMINAR

In Conjunction with the

30th Annual Scientific and Clinical Session

AMERICAN CONGRESS OF PHYSICAL MEDICINE

August 25, 26, 27, 28, 29, 1952

THE ROOSEVELT — **NEW YORK, N. Y.**

SCHEDULE

Physicians and registered physical and occupational therapists may enroll for either series.

MONDAY MORNING — AUGUST 25	
(A) 10:00-10:50 A.M. Physiologic Basis of Therapeutic Exercise — Hellebrandt	(B) 11:00-11:50 A.M. Physiologic Basis of Therapeutic Exercise — Hellebrandt
MONDAY AFTERNOON — AUGUST 25	
(C) 3:00-3:50 P.M. Functional Anatomy of Spine — Markee	(D) 4:00-4:50 P.M. Functional Anatomy of Forearm and Hand — Markee
TUESDAY MORNING — AUGUST 26	
(E) 8:30-9:20 A.M. Present Status (Experimental) of Ultrasonics — F. Krusen	
WEDNESDAY MORNING — AUGUST 27	
(F) 8:30-9:20 A.M. Electromyographic Studies in Poliomyelitis — Knowlton	
THURSDAY MORNING — AUGUST 28	
(G) 8:30-9:20 A.M. Research Methodology — Lion	
FRIDAY MORNING — AUGUST 29	
(H) 8:30-9:20 A.M. Effects of Age on Physiologic Function and Its Implications in Rehabilitation	

MONDAY MORNING — AUGUST 25	
(1) 10:00-10:50 A.M. Vocational Counseling — Usdane	(2) 11:00-11:50 A.M. Back Pain — Problems in Industry — Russek
MONDAY AFTERNOON — AUGUST 25	
(3) 3:00-3:50 P.M. Treatment of Cerebral Palsy — Perlstein	(4) 4:00-4:50 P.M. Evaluation of Cerebral Palsy Child — Perlstein
TUESDAY MORNING — AUGUST 26	
(5) 8:30-9:20 A.M. Modern Upper Extremity Prosthesis and Rehabilitation of Upper Extremity Amputees	
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(6) 8:30-9:20 A.M. Practical Psychiatric Problems of Which the Physiatrist Should Beware — Sullivan	
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(7) 8:30-9:20 A.M. Supportive and Assistive Splinting of the Upper Extremity — Bennett	
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(8) 8:30-9:20 A.M. Basic Mechanical and Muscular Elements in Pathologic Gaits — Bechtol	

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HISTORICAL NOTE

During recent years the view has been widely expressed that an International Congress of Physical Medicine should be held, and at the International Congress on Medical Electronics held in Brussels in 1948, it was suggested that London might be a suitable place for such an event. To this end the British Association of Physical Medicine was informally approached. The Council of this Association felt strongly that such an endeavor should be a regularly recurring event organized by a permanent international body, and undertook to foster the formation of such an international body.

As a preliminary step, the Interim Committee of the International Federation of Physical Medicine was set up in May, 1950, under the Chairmanship of Dr. Frank Krusen, Rochester, Minnesota, U. S. A., with Dr. Svend Clemmesen, Copenhagen, Denmark, as Vice-Chairman. This Interim Committee issued reports on its activities and drafted regulations which were circulated to national Associations of Physical Medicine, with the object of securing international support and the nomination of national representatives. As a result of this Committee's further efforts, membership of the Council for the Co-Ordination of International Congresses of Medical Sciences was secured. Having decided that the first Congress under its auspices would be held in London, the Committee invited the British Association of Physical Medicine, as the national association concerned, to appoint a small committee with powers to form an independent Board of Management responsible for the organization of an International Congress of Physical Medicine in 1952. At the Congress, which will be held in London, a meeting of the national representatives will be called and asked to form the International Committee of Physical Medicine.

MECHANISM OF ABSORPTION OF ULTRASONIC ENERGY IN BLOOD *

GEORGE MORRIS PIERSOL, M.D.
HERMAN P. SCHWAN, Ph.D.
ROBERT B. PENNELL, Ph.D.
and
EDWIN L. CARSTENSEN, M.S.

Center for Instruction and Research in Physical Medicine, Graduate School of Medicine and Moore School of Electrical Engineering, University of Pennsylvania
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If high frequency sound is to be used as a clinical tool, it is important that we increase our knowledge of the fundamental acoustic properties of the tissue that is to be treated. Accordingly a program has been undertaken which includes the measurement of the absorption and velocity of sound in the various body tissues and blood. The motivation for this work is twofold. First, the data are the basis for a phenomenological description of the heating processes in ultrasonic diathermy. Second, by study of the absorption data for the various tissue components, it is possible to draw conclusions regarding the actual mechanism of the conversion of high frequency mechanical energy into heat.

Two general classes of absorption participate to varying degrees in the losses characteristic of the various tissues. The first will be called volume absorption; this includes those losses characteristic of completely homogeneous liquids and solids, i. e., it may include viscous losses, losses resulting from the conduction of heat, molecular relaxation and elastic hysteresis. The second will be called structural absorption; this includes all those losses resulting from the presence of abrupt interfaces in the tissue. These losses may arise from scattering, multiple reflections, and the development of highly damped shear waves. These shear waves may enter into the heating process as follows: Both shear (transverse) waves as well as compressional (longitudinal) waves can be supported by solid media. Furthermore, when a compressional wave strikes an interface, the reflection may be a complex combination of shear and compressional waves. The shear wave may be expected to decay rapidly, producing localized heating in the region of the interface.

Blood was chosen to begin the investigation because it has properties in common with the body tissues and yet is sufficiently simple and homogeneous that it can be measured with a relatively high degree of accuracy.

Although blood contains small structural units in the form of the blood corpuscles, the measurements of this investigation have shown that the absorption of sound in blood is almost entirely of the volume type.

Experimental Methods

The technique used for the measurement of ultrasonic absorption is in effect a comparison of the properties of a test liquid with those of water.

* Aided by a grant from the National Foundation for Infantile Paralysis, Inc.

The mechanical arrangement is shown in figure 1. The test vessel here is divided into two compartments by a rubber diaphragm. One-half is filled with water, the other with the liquid under investigation. The transducers are mounted on a sliding assembly, the source in the water chamber, the receiver in the test liquid. By moving this assembly along the axis of the test tank it is possible to substitute arbitrary amounts of test liquid for water in the acoustic path. Measurements of attenuation of the acoustic energy as a function of assembly position then can be used for calculation of the absorption.* Units of absorption used in this paper are decibels per centimeter.† The overall error of the absorption determinations is estimated to be between 0.02 and 0.04 db/cm.

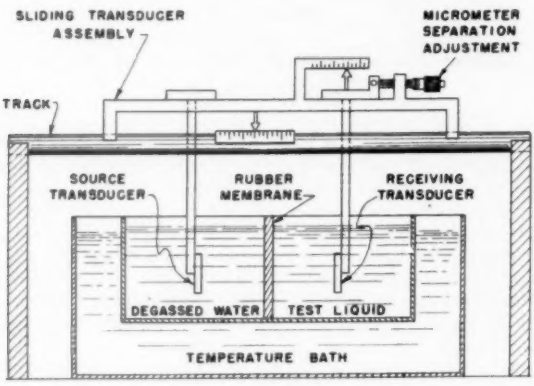

Fig. 1. — Mechanical arrangement for measuring ultrasonic absorption.

Temperature control was maintained by a constant temperature bath which could be regulated to within a few tenths of a degree from 0 to 50 C.

The intensity levels used for these measurements were far below those necessary to produce cavitation (bubble formation resulting from large negative pressures). The actual intensities used ranged from 1 microwatt to 1 milliwatt per square centimeter. Over this range there were no indications of a dependence of the absorption on intensity.

Both water and the test liquid were placed under vacuum for a few minutes before measurement to remove a part of the normally dissolved gases. Both optical density and electrical resistivity measurements were made on blood samples treated by this method to make certain that no red cells were destroyed by the evacuation.

Experimental Results

The absorption of sound in blood was measured as a function of the concentration of red cells, figure 2. The various concentrations were obtained by mixing the cell residue of centrifuged blood with human plasma. The result is a linear dependence of the absorption upon concentration. However, it is apparent that absorption in plasma, although small, is by no means negligible.

* This method has been described in detail in a paper entitled, "The Acoustic Impedance of Human Blood," presented at the May, 1951, meeting of the Acoustic Society of America.

† The decibel is ten times logarithm to the base 10 of the ratio of the intensities at two points along the acoustic path, e. g., a loss of 3 db signifies a reduction of the intensity to one-half that of the reference level.

Since there are no cells or tissue structure in the plasma, it follows that volume absorption must be considered as at least one of the contributing factors in the total absorption process. Now the absorption of sound in water or physiological saline is negligible compared with that of plasma. Hence,

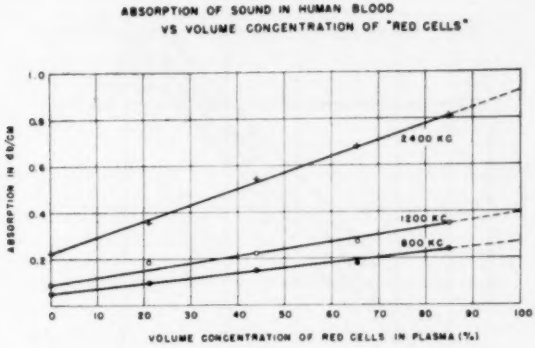

Fig. 2. — Absorption of sound in human blood as a function of volume concentration of red cells.

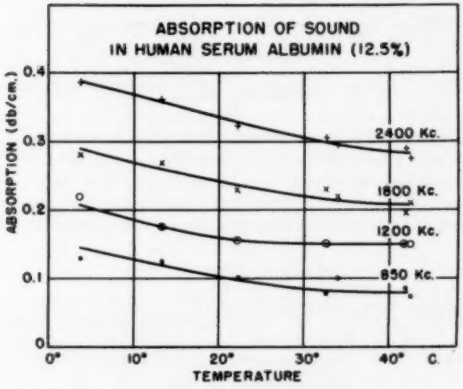

Fig. 3. — Absorption of sound in a 12.5 per cent solution of normal human serum albumin.

it may be postulated that the protein molecules in solution in the plasma are responsible for its absorption.

Measurements subsequently have been made on the following blood components: concentrated red cells from horse blood, horse plasma, a 7 per cent solution of human hemoglobin[1] containing no stromata, a 12.5 per cent solution of normal human serum albumin, and a suspension of stromata. The stromata were prepared by hemolysing red cells with 10 volumes of water saturated with carbon dioxide and subsequently washing the precipitated

1. Pennell, R. B., and Smith, W. E.: Preparation of Stabilized Solutions of Hemoglobin, Blood, J. of Hematology, 4:380, 1949.

stromata by repeated resuspension in carbon dioxide-saturated, distilled water until no further pigment could be removed. The hemoglobin and other cell contents are released by this procedure leaving only the structural portion of the cell. In this process the membrane structure is, in general, partially destroyed. However, electrical impedance measurements of the stromata in-

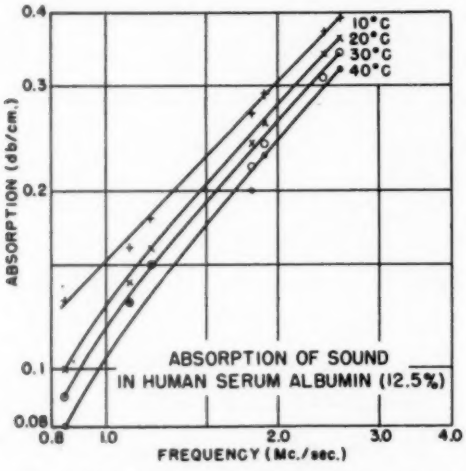

Fig. 4. — Absorption of sound in a 12.5 per cent solution of normal human serum albumin.

dicate that approximately ten per cent of the cell membranes remain intact. The absorption was measured over the frequency range from 800 to 2400 kilocycles and the temperature range from 5 to 45 C. The data for albumin are typical of the entire set of measurements. In figure 3 absorption is plotted as a function of temperature. The temperature coefficient is negative and

TABLE 1. — *Absorption Data.*

FREQUENCY (Mc./sec.)	TEMP. (CENT.)	SUBSTANCE	PROTEIN (gm/100cc)	MEASURED ABSORPTION (db/cm.)	ABSORPTION PER gm/100cc (db/cm.)
1.2	20	PLASMA	5.5	0.08	0.014
		RED CELLS	32.0	0.40	0.013
		HEMOGLOBIN	7.0	0.09	0.013
		ALBUMIN	12.5	0.16	0.013
1.2	40	PLASMA	5.5	0.07	0.012
		RED CELLS	32.0	0.34	0.011
		HEMOGLOBIN	7.0	0.08	0.011
		ALBUMIN	12.5	0.14	0.011
2.4	20	PLASMA	5.5	0.16	0.030
		RED CELLS	32.0	0.94	0.029
		HEMOGLOBIN	7.0	0.17	0.024
		ALBUMIN	12.5	0.34	0.027
2.4	40	PLASMA	5.5	0.13	0.023
		RED CELLS	32.0	0.77	0.024
		HEMOGLOBIN	7.0	0.15	0.021
		ALBUMIN	12.5	0.29	0.023

increases slightly in magnitude at the lower temperatures. Figure 4 presents these same data as a function of frequency.

Table 1 summarizes the absorption data for samples of plasma, concentrated red cells, hemoglobin and albumin. Differences in plasma absorption from sample to sample were as high as 30 per cent. The plasma data given in the table are averages for several samples of horse plasma. Protein determinations were made by the Kjeldahl method. The actual measured absorption is given for the frequencies 1.2 and 2.4 megacycles and for 20 and 40 C. The data are then reduced to an equivalent absorption for a 1 per cent solution of protein by weight. This step, therefore, assumes a linear relation between absorption and concentration. This assumption has been validated for the red cells by direct experimental measurement.

Discussion

First, compare the data of table 1 for the red cells and hemoglobin. The similarity of the data in these two cases show that the protein, hemoglobin, is responsible for the absorption and that whether or not it is contained in cells makes very little difference. In addition, the table shows that the absorptions per gram for all the protein solutions investigated are the same within the limits of experimental error. If the size of the molecule is important in determining the absorption, it is reasonable to make such a comparison. Both hemoglobin and albumin have molecular weights of the order of 60,000 — 70,000 and axis ratios of the order of 5 to 9. More than 90 per cent of the red cell protein is hemoglobin. In plasma roughly 60 per cent of the proteins are albumin. The globulins, which make up the remaining fraction of the plasma proteins, however, are from 2 to 7 times larger than albumin and in certain cases highly asymmetric. Yet, it is unlikely that any one of the globulins is present in sufficient quantity to show its characteristics in the total plasma absorption.

The absorption of a suspension of stromata in the concentration found in the red cell residues of centrifuged blood is approximately 0.03 db/cm. at 1.2 megacycles and 20 C. In other words, the cell membrane accounts for less than 10 per cent of the 0.40 db/cm. measured for concentrated red cells at this temperature and frequency. Thus, if structural losses exist, they can account for only a small part of the total absorption. On the other hand, it is reasonable to classify even these small losses caused by the stromata as volume absorption. A computation, using the values of Ponder[2] for the dry weight of the stroma, gives the value 0.025 db/cm. for the absorption of a suspension of one gram of stromata per 100 cc. This is roughly twice the comparable value for the protein solutions of table 1. However, in view of the highly ordered arrangement of the structural proteins of the stroma, this may be considered rather close agreement.

It may, therefore, be concluded that volume absorption is almost entirely responsible for the losses in blood and furthermore that, at least for similar molecules, the absorption is in direct proportion to the quantity of protein present.

It is interesting to speculate further regarding the losses caused by the proteins. Simple, classical viscous and heat conduction losses can be ruled out, since both these mechanisms give an absorption which depends upon the square of the frequency, whereas the measured absorptions were all very nearly linear functions of frequency over the range investigated. A more likely possibility is that the absorption results from some form of molecular relaxation. One example of such a process would be the rotation of the molecule about one of its axes through coupling between translational and rota-

2. Ponder, E.: Red Cell Cytochemistry and Architecture, Ann. New York Acad. Sc., April 19, 1946.

tional forces. At very low frequencies the molecule can respond completely. At very high frequencies, on the other hand, the large inertia of the molecule will prevent it from responding to the rotational forces. Such an absorption mechanism could account for the frequency dependence of the absorption which has been observed in these measurements. An equally plausible explanation of the observations is that the large loosely bound protein molecules are not completely elastic under compressional and dilitational forces, i. e., when the compressional force has been applied and then removed the molecule may not completely return to its equilibrium size or shape. This amounts to a kind of elastic hysteresis.

Conclusions

The investigation of blood and its components has shown that the presence of protein molecules is sufficient to account not only for the entire absorption in blood but also for a significant portion of the absorption in many of the solid tissues. Thus in studying the effects of intense sound on tissue, it would appear wise to give particular attention to the proteins. Wu[3] and Liu in 1931 and Chambers[4] and Flosdorf in 1936 reported coagulation of egg albumin by ultrasonic and sonic vibrations. In both cases this phenomenon was associated with cavitation. However, it is apparent from the present work that even in the absence of cavitation strong, dissipative forces are exerted on the protein molecules. The mechanisms of the action of ultrasound with and without cavitation should be quite different.

The importance of the proteins in the absorption processes should by no means rule out consideration of structural absorption in the solid tissues. Nelson[5] and others have shown that excess heating does occur at macroscopic interfaces. This investigation has shown, however, that interfaces of the size of the red cell membrane are too small to produce a significant reflection or scattering of waves of the order of 1 millimeter in length. Thus, specific effects on cell membranes are not to be expected. More work will be required to determine the precise conditions under which structural absorption becomes important.

ACKNOWLEDGEMENTS: The authors wish to acknowledge the important help of Dr. John G. Reinhold, Assistant Professor of Physiological Chemistry, Hospital of the University of Pennsylvania, for performing the protein determinations used in this work, Mr. John Parnell of the Moore School of Electrical Engineering of the University of Pennsylvania, and Dr. George Cathers of the Franklin Institute, for many helpful discussions and Messrs. Kam Li and Charles Mack for assistance in performance of measurements.

3. Wu, H., and Liu, S. C.: Coagulation of Egg Albumin by Supersonic Waves, Proc. Soc. Exper. Biol. & Med. **28**:782, 1931.
4. Chambers, L. A., and Flosdorf, E. W.: The Denaturation of Proteins by Sound Waves of Audible Frequencies, J. Biol. Chem. **114**:75, 1936.
5. Nelson, P.; Herrick, J. F., and Krusen, F. H.: Temperatures Produced in Bone Marrow, Bone and Adjacent Tissues by Ultrasonic Diathermy, Arch. Phys. Med. **31**:687, 1950.

PRESCRIBED OCCUPATIONAL THERAPY *

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The prescription of occupational therapy can be discussed from various approaches: that of the physician, that of the occupational therapist and that of the actual terminology of a prescription.

Medical students in schools now offering elective or required courses in Physical Medicine and Rehabilitation are probably exposed to at least one hour of formal discussion about occupational therapy. Residents in Physical Medicine and Rehabilitation are undoubtedly spending more time in study of this field. Probably the only other physicians who have had any lectures or discussions of occupational therapy are those residents trained in Veterans Administration Psychiatric and Tuberculosis hospitals where a full rehabilitation program has been developed with a Physiatrist in charge.

Occupational therapists often work independently in all types of hospitals without any medical guidance. The situation, in general, is no different from that which Dr. William Benham Snow describes[1] as the situation at Columbia Presbyterian Medical Center up until approximately six years ago where (quote) "occupational therapy . . . was an independent service freely available to the total medical staff, but directed by an occupational therapist accountable to one of the woman's auxiliary lay committees." Under this system, the occupational therapist received "requisition" to treat patients. These were not prescriptions.

Dr. Snow analyzed six months of such requisitions furnished in 1950 from three sections of the Columbia University Medical Center, and found that the occupational therapy procedures could be considered to have been used for diversion, mental hygiene, psychiatric help or kinetic treatment (old term, functional).

A few "requisitions" were rejected. It seems safe to assume that the treatment category as well as that of rejections, may well have been subject to the decision of an occupational therapist rather than a physician. Furthermore, the usual requisition probably merely called for "occupational therapy." Such requisitions could not be considered prescriptions. The statistics from Columbia can probably be duplicated in most general hospitals where occupational therapists are employed.

If occupational therapy is really a worth-while therapeutic procedure, then a request labeled merely "O. T." places an occupational therapist in exactly the same position of practicing medicine as it does any physical therapist who receives and accepts a prescription for "P. T." The technical directors of any approved occupational therapy school, and their graduates, will all tell you that they work only under a doctor's prescription. The Baruch Committee on Physical Medicine stated that[2] "This extensive field of medicine practice includes the employment of the physical and other effective properties of light, heat, cold, water, electricity, massage, manipulation, exercise and mechanical devices for physical and occupational therapy, in the

* Read at the Twenty-Ninth Annual Meeting of the American Congress of Physical Medicine, Denver, Colo., Sept. 7, 1951.

1. Snow, William Benham, and White, Helen M.: Economic Factors Involved in the Occupational Therapy Program of a General Hospital, Arch. Phys. Med. 33:315 (May) 1951.

2. Krusen, Frank K.: History and Development of Physical Medicine; Physical Medicine in General Practice. Report of the Baruch Committee on Physical Medicine, April, 1944. Edited by Arthur L. Watkins. J. B. Lippincott Co., Philadelphia.

diagnosis or treatment of disease." Yet, the president of the American Occupational Therapy Association wrote the author of this paper the following: "Occupational Therapy is a professional service available to all medical specialties and as such it has not been deemed advisable that it be under the supervision or administrative control of any other medical specialty group."* This is confirmed in the American Occupational Therapy Association statement of policy.†

The national organization (A. O. T. A.) does not want to affiliate with Physical Medicine exclusively, which would subject them to (and have) medical direction from physicians who have training in their field. The argument that a physiatrist would not know how to prescribe for a tuberculous or psychiatric patient is sheer nonsense. The national organization prefers to control their national registry rather than affiliate in any way with the American Medical Association. The implication is that organized occuptional therapy does not want good medical supervision, but prefers its therapists either to practice medicine or be supervised or accountable: — as Dr. Snow said, "to one of the women's auxiliary lay committees."

Many physicians realize the value of occupational therapy. Physiatrists who have opportunity to coordinate physical and occupational therapy are able to increase the importance of occupational therapy and to find many real therapeutic uses for it — not just diversion. The Baruch Committee definition elevates occupational therapy to an equal level with physical therapy as a therapeutic tool. Occupational therapists are defeating themselves and delaying progress as long as they are unwilling to align themselves with the medical specialty where physicians also have formal training in the therapeutic use of this field.

It is a fine thing to report proceeds of sales to a women's auxiliary group, be patted on the back, then have the same volunteers interested enough to get donations for another loom. The occupational therapist becomes a king or queen to this group. It is not always easy to relinquish this position of authority and work under medical supervision.

Physical therapists have faced the same problem for years — but in a slightly different fashion. The difference was well expressed by a legal advisor for the American Medical Association, particularly concerned with Physical Medicine and Physical Therapy. This question was asked: if physical therapy licensing legislation is important then why should the occupational therapist not be licensed also; the Baruch Committee's definition of Physical Medicine includes both equally? The answer was: since the occupational therapists never do anything to hurt patients, they have no need for licensure. Since anyone who deals with patients can hurt them by mistreatment or

* Personal communication to author dated August 4, 1950.

† *STATEMENT OF POLICY* — American Occupational Therapy Association. Occupational Therapy is a professional service which uses purposeful activities to aid the patient in recovery from and/or adjustment to disease or injury. It is prescribed by the patient's physician and administered by the occupational therapists with consideration not only of the specific disability but also of the patient's physical, mental, emotional, social and economic needs.

Relationship with the Physician.

In the fields of psychiatry, pediatrics, tuberculosis and other medical specialties it is essential that the patient's physician prescribe occupational therapy in relation to the total treatment program. In order to insure continued guidance it is necessary that there be frequent contact between the therapist and the physician.

The Education of the Occupational Therapist.

The Education of the occupational therapist has been determined by the demand of the various fields of medicine in which this service is needed. Balance in emphasis on the medical specialties must, therefore, be maintained.

The American Occupational Therapy Association Educational Program.

The American Occupational Therapy Association believes its professional courses can be most effectively directed by qualified occupational therapists in accordance with the essentials established by the American Medical Association for acceptable schools of occupational therapy. Advisory committees made up of representatives of the medical and allied professional fields are invaluable to the administration of the educational program.

Registration.

Professional registration is an integral part of the educational program and as such has been established and is maintained under the jurisdiction of the American Occupational Therapy Association.

mishandling, this is a sorry commentary on any therapeutic value of occupational therapy. Even the "push button" technicians in "physiotherapy" have wanted medical coverage to take responsibility for a burn or some untoward result in treating a fracture. When there is no physiatrist, many physical therapists still receive prescriptions for "P. T." or "heat, massage and exercise." After they have examined the patient they tactfully call the referring physician and get clearance for their suggested treatment. It is doubtful if this is a common occuptional therapy practice.

The occupational therapists have a right to make certain requests regarding their prescriptions. First, they do not want one craft specified except in very special instances. A choice of crafts can often be used to fulfill the prescription and provide the patient with an activity that interests him. Furthermore, particularly for kinetic occupational therapy, if the prescription does not limit the craft, the therapist can graduate the patient from light to medium to heavy work as his strength, range of motion or physical tolerance improves.

Secondly, they feel that a moderate leeway of time should be permitted rather than exact minutes in specifying work tolerance. Attention span may be even shorter than the patient's physical tolerance so that it may take several short periods to fulfill a prescription for the exact time. As the patient's attention span and interest improve, so may his physical tolerance.

Some occupational therapists have been trained to check pulse and respirations and have received more lectures from physicians than others. When all occupational therapists have had medical training at least equal to that of the physical therapist (preferably by combined school), then their judgment of physical tolerance can be trusted still more. Clear cut tests for physical tolerance are still inadequate. Daily work with a patient and observation often offer the basis for quite adequate judgment of a patient's tolerance.[3]

Logically, the next point to consider is the terminology to be used in prescribing occupational therapy. A more unified terminology is needed. In 1947 Dr. Sidney Licht made a plea for a change in nomenclature for occupational therapy prescriptions and published a proposed outline.[4] That nomenclature is clear and generally accepted, but advances in Physical Medicine and Rehabilitation since 1947 necessitate further additions to occupational therapy prescriptions. A proposed new outline is as follows:

PRESCRIPTION FOR OCCUPATIONAL THERAPY

Department of Physical Medicine and Rehabilitation Hospital for Chronic Illness, Rocky Hill, Connecticut.

A. DEFINITIVE

I. Kinetic (functional)
   a. Muscle strength
   b. Joint mobilization
   c. Coordination

II. Metric
   a. Improve work tolerance
   b. Measure progress of tolerance

III. Tonic
   a. Muscle tone
      1. Recondition
      2. Prevention of decondition
   b. Mental tone
      1. Stimulation
      2. Sedation

IV. Psychiatric
   a. Psychomotor activity
      1. Stimulation
      2. Sedation
   b. Emotional disturbance
      1. Emotional stability
      2. Mood
   c. Behavior training
   d. Abnormal mental content
      1. Guilt complex
      2. Paranoid trends
   e. Psychosocial activity
      1. Socialization
      2. Provide obtainable objective
   f. Diagnosis
      1. Reaction during treatment

3. Clarke, H. Harrison: Application of Measurement to Health and Physical Education, Prentice-Hall, Inc., New York, 1950.
4. Licht, Sidney: The Prescription of Occupational Therapy, New York State J. Med. 48:1032 (May 1) 1948.

2. Identification of problems
3. Determine intellectual work capacity
4. Prevocational exploration

g. Mental Hygiene
1. Overcome restlessness
2. Promote good work and play habits

B. ACTIVITIES OF DAILY LIVING

I. Bed activities
a. Put on and remove pajamas
b. Turn pages of book and newspaper
c. Wind wrist watch
d Open and close safety pin

II. Hygiene
a. Wash face, hands and extremities
b. Trim and clean nails
c. Brush teeth and comb hair
d. Shave or women apply cosmetics

III. Eating
a. Eat with fingers, butter bread
b. Eat with fork or spoon
c. Cut meat with knife and fork
d. Drink from glass or cup

IV. Dressing
a. Put on and remove slipover or button shirt, hose and slippers, tie or buckle shoes
b. Tie bow or tie

V. Utilities (ability to operate)
a. Door fastenings
b. Light switches
c. Window, blind and shade
d. Pencil sharpener and scissors
e. Faucets and bottle tops

VI. Communication (ability for and training in)
a. Write or type name
b. Use dial pay telephone
c. Tell name and address
d. Understand directions
e. Open letter, read and replace
f. Handle money

C. PREVOCATIONAL TESTING

I. Work habits
a. Neatness and accuracy
b. Speed and ability
c. Alertness and concentration
d. Works best alone or with others
e. Follows instructions

II. Personality and attitude factors
a. Interest
b. Cooperation
c. Stability
d. Shows initiative
e. Shows leadership

III. Work abilities
a. Finger dexterity and grasp
b. Reaching, lifting and carrying
c. Ability to handle power and hand tools
d. Arm motion and coordination
e. Use of affected parts.

The foregoing outline divides occupational therapy into three divisions — definitive, functional and prevocational. The written prescription need not be as detailed as all the sub-headings in each section imply.

Physical therapists and corrective therapists are training patients in "Activities of Daily Living" so that physical rehabilitation may be accomplished. This is called "functional" training to differentiate it from the specific and definitive treatments used in physical therapy to treat affected parts of the body. A well-rounded Physical Medicine and Rehabilitation Department has the occupational therapists teaching Activities of Daily Living, involving use of the hands in eating, dressing, shaving and writing, and use of all ordinary utilities. The use of the hands for learning these procedures is a natural occupational therapy activity. This should also be called "functional" in occupational therapy.

If any occupational therapy is definitive treatment, then it should particularly apply to prescriptions which request a craft to increase range of motion, strength or coordination for one or both hands, wrists, elbows or of an entire extremity. While this type of occupational therapy has been called "functional" for years, use of the term "kinetic" is far more specific and descriptive.

Not all occupational therapy schools have placed sufficient stress on either functional training in Activities of Daily Living or in prevocational testing. Occupational therapists should be able to furnish much valuable prevocational information which would be a definite help to the manual arts therapists, vocational counsellors or potential employers. While the occupational therapist is not expected to do vocational counselling, he or she can tell a vocational counsellor if the patient is able to do fine finger work; if the arm and hand movements need be gross; if the patient can follow instructions, or if he must be consistently supervised; if he is a neat and steady worker, or whatever his physical tolerance or attention span may be. Furthermore, therapists, with their knowledge of kinesiology, are able to devise adjustable splints or other

adaptive gadgets that will make certain activities or occupations possible. This information a manual arts therapist will not have.

Severely disabled patients or those with poor physical tolerance can best start with light craft work and be graduated to heavier work whether it is in occupational therapy or in manual arts. Some patients are physically and mentally able to do occupational therapy and manual arts therapy simultaneously. The development of physical tolerance and the correct use of the injured nerves, muscles and joints requires some medical training. Since manual arts and educational therapists have had no medical training, and corrective therapists little or none in their physical education courses, supervision of manual arts therapy and educational therapy by occupational therapists, and corrective therapists by physical therapists, is medically advisable. It should also improve the coordinate team work program of total rehabilitation for the whole man. Each group can also learn from the other. Occupational therapists may be able to start primary prevocational testing long before a patient is physically able to start in manual arts. The occupational therapist is not turned into a vocational counsellor because of the prevocational testing, but he or she becomes more aware of the total problem, just as he or she is made more aware of physical therapy if permitted to work on a coordinate program with physical therapists under the guidance of a physiatrist who has the concept, philosophy, and training to prescribe a total program. Occupational therapists and physical therapists can work together on functional training. The occupational therapist can learn to interpret manual muscle tests and how to measure range of motion — thereby making their own kinetic treatment more accurate.

Sedgwick Mead discussed "Failures in Occupational Therapy"[5] at the American Congress of Physical Medicine meeting in 1950. Both Snow and Mead have clearly pointed out the obvious faults. No matter how excellent the training is in approved schools of occupational therapy, no matter how sincere the director and the students, recognition of the field as a therapy will probably not come until certain policies are changed. It should be apparent that the correct prescription of occupational therapy can only be done by physicians trained in the field if occupational therapy is to be dignified by the term "therapy." The occupational therapists can strengthen their position and win respect for their chosen profession only when they are willing to ally themselves officially with specially trained physicians. They can also strengthen their profession by being willing to ally themselves more closely with the American Medical Association. Furthermore, if physical therapy and occupational therapy were to have equal licensure, they would be on an equal legal level of recognition. Until they are willing to make these changes for strength and growth, outside of special Physical Medicine and Rehabilitation centers, we can assume occupational therapy will be nothing but fluttery attempts at diversion and not prescribed therapy.

Two recommendations are made in conclusion:

1. That the executive committee of the American Congress of Physical Medicine appoint a committee to meet and adopt standard terminology for the prescribing of occupational therapy. (Perhaps the outline presented here could be a basis for an official terminology.)

2. That official recommendation be made to the American Occupational Therapy Association by the American Congress of Physical Medicine as to suggested changes in policy that this medical association feels would strengthen the occupational therapy profession, and officially make those therapists a

5. Mead, Sedgwick, and Alex Harell: Failures in Functional Occupational Therapy, Division of Physical Medicine, Washington University School of Medicine, read at Annual Meeting, American Congress of Physical Medicine, September, 1950.

part of the field of Physical Medicine and Rehabilitation as officially defined by the Baruch Committee on Physical Medicine.

Discussion

Dr. Herman L. Rudolph (Reading, Pa.): It is gratifying to note increasing interest in the field of Occupational Therapy with allotment of precious time to a paper on the subject. The pathetic pre-war state of a floundering group has been transformed only in the past several years to one of considerable importance particularly in the field of Physical Medicine and Rehabilitation. During the past war many of us were in a position to watch the development of Occupational Therapy from a relatively unknown entity to its present peak of performance in the military hospital. The elaborate departments in the veterans' hospitals and a number of the large city institutions are patterned chiefly after the military and are maintained as far as I know as components of the Physical Medicine and Rehabilitation Services whose directors, physiatrists, are responsible for function of the Occupational Therapy Sections. It is with pardonable pride but with due humility that I consider myself well-informed in matters of Occupational Therapy. Dr. Covalt's information concerning the O. T. Association hierachy's statement of policy to the effect that it is undesirable to be under the supervision or administrative control of any one medical specialty is shocking news to me. There is reason to believe that this could not be the consensus in the rank and file of working Occupational Therapists. That Occupational Therapy can avert stagnation at pre-war levels without supervision by one medical specialty is utterly fantastic and sheer nonsense and bespeaks misinformation and misguidance. Be that as it may, it being undeniably true that the specialty of Physical Medicine and Rehabilitation has been the prime sponsor in the revival of O. T., the Congress should endorse Dr. Covalt's recommendation by immediate appointment of a committee to study ways and means to secure and maintain affiliation of O. T. with the field of Physical Medicine and Rehabilitation.

The matter of prescription may or may not be a problem, depending on one's point of view. Because of the individuality of human frailties inherent in physician, therapist, and patient, the standardization of anything in O. T. is hardly desirable. The therapist may want necessary information by prescription, but until some very far distant future when all physicians prescribing O. T. will be fully informed, the better method of securing this necessary information is a tactful discussion with the referring physician. I concur in the desire to avoid craft specification; the qualified therapist with a good background in craft analysis will, except in a rare instance, hardly ever encounter request for a specific craft.

Standardization of terminology is probably premature. Dr. Covalt presents a comprehensive outline which further expands yet simplifies the approach to a suitable prescription. I am sure, however, there will be some dissension and differences of opinion. It is hoped that this paper may stimulate thought along this line and with additional material for consideration, perhaps unanimity of opinion concerning terminology may be attained sooner or later to energize general acceptance.

Dr. Gloria Roth (Denver, Colo.): I don't want to go into too much detail because I imagine I may be a little out of order; but I believe the viewpoint of our national office, on affiliating with the Congress of Physical Medicine is based upon the fact that occupational therapy does have many other fields beside that of physical disabilities and rehabilitation.

The occupational therapist who wants to go into physical medicine usually specializes, and should specialize, to further her knowledge of physical disabilities. The initial training course at the university covers all the various fields — physical disability, psychiatry, pediatrics, GM&S, prevocational work, shelter workshops, and CP programs. It is impossible to have very skilled, fine knowledge of each thing when you graduate; but it is the current trend for the occupational therapist upon graduation to specialize in one field or another, and to go on with good postgraduate study.

Consequently, the occupational therapist who is interested in physical medicine very definitely wants to be under the supervision of the physiatrist in such physical medicine setups, and I believe you will find that the current trend is for the occupational therapist to want as definite a prescription for her work as the physical therapist. Likewise, with the occupational therapist in the psychiatric field the current trend is to be under the psychiatrist directly, and have just as specific a prescription as the occupational therapist wants under the physiatrist.

When there is no physiatrist in charge of the program, the occupational therapist is just as demanding of a correct order from the ward doctor as the occupational therapist is in the other two fields mentioned.

In the field of tuberculosis, which is usually under the physiatrist, the occupational therapist is very happy and willing to cooperate and wants to be under the supervision of the physiatrist. I think it is just a matter of what the specialty may be.

No matter what the specialty is, I believe you will find that the occupational therapist is always willing to be under supervision, particularly those of the newer schools of occupational therapy. It isn't so much not wanting to be under physical medicine — it is more that we are trying to save our over-all program, and want to place ourselves under the appropriate supervision, no matter what field we go into.

Dr. Nila Covalt (Rocky Hill, Conn., closing): I think I need say only that I proved my point.

INEFFECTIVENESS OF ULTRAVIOLET HEMO-IRRADIATION IN DISTEMPER *

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The literature on ultraviolet irradiation of blood suggests the effectiveness of such therapy in the treatment not only of bacterial but also of virus infections. There is sufficient evidence in the literature, since the work of Carré,[1] to show that distemper in dogs is caused by a filtrable virus. It has been successfully transmitted by a bacteria-free filtrate of nasal secretions from an infected dog. Puntoni[2] established the presence of a virulent distemper virus in dogs by serial transmission, utilizing intracranial inoculation. The work of Green and associates[3-5] demonstrated the extensive distribution of the distemper virus. By scraping transitional epithelium from the urinary bladder a rapid method for diagnosis of distemper was introduced. Green stated that the basic virus infection in dogs produced by canine distemper virus is a generalized systemic disease and continues its invasion until mobilization of immunity brings about recovery, or until damage to the animal's tissues causes a fatal termination of the infection. DeMonbreun[6] reported that the virus of canine distemper has a definite affinity for vascular endothelium and for cells of the reticuloendothelial system. In his opinion it spreads mainly by the blood stream and the evidence for its passage along nerve pathways is not convincing.

The consensus is that distemper is a virus disease characterized by an incubation period of three to six days. The temperature rises slightly during the incubation period but returns to normal in a few days. By the tenth or eleventh day a second rise in temperature occurs and gradually a purulent discharge appears on the nostrils and eyes. Both nostrils and eyes are often pasted shut with a sticky exudate. Blood-stained diarrheal feces are accompanied by severe dehydration and reduction of weight. Death may occur shortly, or the animal may slowly recover in several weeks. In some cases

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* Read at the meeting of the American Congress of Physical Medicine, Denver, Colorado, September 6, 1951.

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6. DeMonbreun, W. A.: The Histopathology of Natural and Experimental Canine Distemper, Am. J. Path. **13**:187 (Mar.-Apr.) 1937.

nervous symptoms develop in addition to the respiratory or enteric form of the disease or both. Convulsions may occur infrequently in the beginning but gradually become more frequent until only a few minutes separate the attacks. At necropsy severe bronchopneumonia or severe inflammation of the intestinal mucosa or both are seen. The clinical picture of this virus disease is such that it makes the disease very fitting for appraisal of the effectiveness of ultraviolet irradiation of the blood of dogs stricken with distemper.

The evidence accumulated seems to indicate that the impingement of small, carefully regulated doses of selected ultraviolet rays directly on the blood stream in some way increases the bactericidal properties of the blood stream. Miley[7] stated that ultraviolet irradiation of blood is a practical method of reproducing bactericidal, detoxification, vaccine and vasodilatation effects. He reported[8] rapid disappearance of the classic signs following ultraviolet irradiation of blood in patients suffering from thrombophlebitis.

Miley[9-10] found ultraviolet irradiation of blood alone to be a successful method of controlling acute pyogenic staphylococcemia in 9 consecutive cases. He noted that sulfonamide drugs lowered the resistance to such an extent that ultraviolet therapy failed to control the staphylococcemia when used in conjunction with these drugs.

Miley[11] summarized the chief physiologic events observed after ultraviolet irradiation of blood as follows: (1) rapid and efficient control of bacterial infection other than bacterial endocarditis; (2) control of infections due to a virus or virus-like organism; (3) increase of efficiency of oxygen exchange mechanisms. Rapid disappearance of cyanosis, increase of the ability to breathe freely and the appearance of normal pink coloration of the skin were observed in cases in which bronchial asthma was treated by ultraviolet hemoirradiation. It was stated that an increase in venous oxygen occurred. However, it should be emphasized that if the oxygen in venous blood was increased, it may mean that the tissues were unable to utilize the oxygen brought to them by arterial blood. This may not be a beneficial attribute; (4) another effect of the ultraviolet irradiation of blood was its detoxicating action. Miley reported that toxic symptoms subsided within twenty-four to seventy-two hours after irradiation of blood.

Miley, Seidel and Christensen[12] concluded that ultraviolet irradiation of blood caused a marked and relatively permanent alleviation of severe dyspnea and cyanosis plus an increase in general resistance in a relatively large percentage of patients suffering from intractable bronchial asthma. Barger[13] gave 42 treatments by irradiation of blood to 12 patients who had bronchial asthma. He stated that the outcome was gratifying: the patients, as well as their physicians, spoke cordially of the treatment and of the results.

Miley and Christensen[14] stated that ultraviolet irradiation of blood can be relied on to control an infection of a virus or virus-like nature consistently in a safe and efficient fashion; that the rapid subsidence of toxic symptoms due to infections of a virus or virus-like nature occurs with striking regularity

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12. Miley, G. P.; Seidel, R. E., and Christensen, J. A.: Preliminary Report of Results Observed in Eighty Cases of Intractable Bronchial Asthma, Arch. Phys. Therapy **24**:533 (Sept.) 1943.
13. Barger, G. J. P.: Discussion, Arch. Phys. Therapy **24**:562 (Sept.) 1943.
14. Miley, G. P., and Christensen, J.: Ultraviolet Blood Irradiation Therapy in Acute Virus and Virus-like Infections, Rev. Gastroenterol. **15**:271 (Apr.) 1948.

and closely parallels the results reported following the use of intravenous irradiation of blood in acute pyogenic infections. They expressed the belief that the resistance of the host is raised rapidly and efficiently by a direct stimulating and energizing effect following intravenous introduction of ultraviolet energy. Barger[15] reported observations on patients in the Washington epidemic of bulbar poliomyelitis treated by ultraviolet irradiation of blood which confirmed Miley's findings.

Rebbeck[16-18] reported that practically no increase in temperature was noted after operation when ultraviolet hemo-irradiation was administered preoperatively, and that definite protection was afforded against the usual disastrous spread of uterine infection in the pelvis or into the blood stream. He stated that preoperative ultraviolet irradiation of blood provides a safe means for protection of poor operative risks and causes a marked decrease in the morbidity and mortality rates. He reported recovery of 5 of 7 patients who had Escherichia coli septicemia treated by ultraviolet irradiation of blood. He stressed the fact that there have been no signs of harmful effects in approximately 4,000 blood irradiation treatments with the Knott technique. In discussing this report Barger[19] stated that Rebbeck was moderate in comment on his results in conditions that usually show a high mortality rate. Barger emphasized the surprisingly small range of safe and effective exposure of the blood as it flows turbulently through the irradiating chamber; namely, an exposure of less than nine seconds is relatively ineffective, and an exposure of more than fourteen seconds is increasingly toxic to the body. An exposure of nine to fourteen seconds is believed to be powerfully effective and safe.

Rebbeck treated 110 unselected patients postoperatively by ultraviolet irradiation of blood out of a series of 336 who had undergone operations on the biliary tract. He reported marked reduction in the number and severity of postoperative complications in the cases in which irradiation was used. Abdominal distention was reduced, the need for antibiotic therapy was greatly minimized and thrombophlebitis was decreased in these cases.

Rebbeck and Walther[20] reported that in 1 case they cured proved double septicemia by ultraviolet irradiation of autotransfused blood.

In severe peritonitis with postoperative ileus, Olney[21] reported that ultraviolet irradiation of blood proved to be by far the most effective treatment. He[22] stated that in his twenty-five years of practice he had never found any treatment for chronic pelvic cellulitis that compared with ultraviolet irradiation of blood. In his hands, the relief to patients by such treatment was very marked and it was possible to avoid surgical removal of structures that were inflamed.

Moor and associates[23] came to the conclusion that ultraviolet irradiation of blood containing experimentally added bacteria produced no decrease in the number of viable bacteria, and that autotransfusion of irradiated blood had no effect on the mortality rate or time of survival of rabbits given small doses of botulinus toxin. They stated that there is no basis for the use of

15. Barger, G. J. P.: Discussion, Arch. Phys. Med. **29**:342 (June) 1948.
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22. Olney, R. C.: Ultraviolet Blood Irradiation Treatment of Pelvic Cellulitis; Knott Method, Am. J. Surg. **74**:440 (Oct.) 1947.
23. Moor, F. B.; Hoyt, R. E., and Levine, M. G.: An Evaluation of Hemoirradiation Therapy, Arch. Phys. Med. **29**:358 (June) 1948.

hemo-irradiation in the treatment of infections. Barger[24] agreed with Moor and associates[23] concerning the failure to decrease the number of viable bacteria but stated that the disappearance of septicemia and clinical recovery was actually a more subtle process requiring twenty-four to forty-eight hours. He stated that clinical work with new therapeutic procedures of necessity runs far ahead of the scientific research to provide its rationale.

Methods

Before we proceeded with this study Dr. Knott came in person to Rochester, discussed the machine with us in detail and explained all the particulars of the procedure of hemo-irradiation in a very objective and most commendable manner. In fact, he emphasized that he is interested in finding out most scientifically and objectively whether the procedure really has a place in therapy. The procedure that he gave us in detail, and which we followed meticulously, is as follows: Three important factors were kept strictly constant; (1) the amount of blood withdrawn and irradiated; (2) the time of exposure to ultraviolet energy; (3) the intensity of ultraviolet radiation.

The amount of blood withdrawn and irradiated was 1.5 cc. of blood per pound of body weight. By a very careful procedure Knott[25] found that the total amount of blood to be irradiated is about one sixteenth to one twentieth of the estimated blood volume or approximately 1.5 cc. per pound of body weight. Twenty cc. of blood were irradiated every ten seconds. This was done by setting the volume control of the pump at 20.

The intensity of ultraviolet radiation is regulated by the voltmeter control, which was operating strictly between 50 and 55 volts during irradiation of the blood. Irradiation was delayed until the lamp voltage built up to 50 volts.

Thirty dogs stricken with distemper were used in this study; 15 were kept as controls and 15 were irradiated. The neck of each treated dog was shaved and cleaned with soap and water and then with thiminosal (Merthiolate®) solution. The calculated amount of blood (1.5 cc. per pound) was withdrawn aseptically from the jugular vein into a syringe containing the required quantity of sodium citrate to prevent clotting and the mixture was returned by the action of the blood control unit of the hemo-irradiator to the dog's venous circulation after having been exposed enroute to ultraviolet rays at the rate of 20 cc. every ten seconds. Irradiation was continued until all the blood was out of the machine. Special precautions were taken to close the shutter and prevent irradiation of any of the saline solution infused either before or after the blood was transfused.

Four groups making a total of 30 dogs with distemper were used in this study; 15 were kept for controls and 15 were treated with ultraviolet irradiation of blood, according to the procedure described previously. The dogs in each of the four groups were divided equally; one half of them were used as controls, the other half were irradiated. The treated as well as the control dogs were kept in the kennels under identical conditions and given the same food and care. From past experience with distemper it has been learned that either recovery or death of the animal usually occurs within fifteen days from the start of illness. This was the reason for our taking fifteen days as the period during which the animals were closely observed.

24. Barger, G. J. P.: Discussion, Arch. Phys. Med. 29:364 (June) 1948.
25. Knott, E. K.: Development of Ultraviolet Blood Irradiation, Am. J. Surg. 76:165 (Aug.) 1948.

TABLE 1. — *Effect of Ultraviolet Hemo-irradiation on Distemper in Dogs.*

	Group 1		2		3		4		Total	
	Controls*	Irradiated	Controls*	Irradiated	Controls*	Irradiated	Controls*	Irradiated	Controls*	Irradiated
Number of animals used	3	3	4	4	4	4	4	4	15	15
Number that remained alive†	2	2	3	1	2	3	4	2	11	8
Number that died‡	1	1	1	3	2	1	0	2	4	7

* The controls were given no therapy.
† Alive 15 days after hemo-irradiation.
‡ Died within 15 days after hemo-irradiation.

Results

At the end of fifteen days, 11 of the 15 control dogs remained alive, while of the 15 dogs which were given ultraviolet irradiation of blood, only 8 were still alive on the fifteenth day after treatment. Seven of the dogs which were given ultraviolet irradiation of blood died, while only 4 of the untreated controls died. Table 1 gives the data in detail on both the treated and control dogs.

From the data obtained on the 30 dogs with distemper, it can be stated that ultraviolet irradiation of the blood according to the standard procedure is ineffective in the therapy of distemper.

Discussion

Dr. R. C. Olney (Lincoln, Nebraska): It is my duty as President of the American Blood Irradiation Society to discuss this paper on behalf of the membership of that Society, who are all Fellows of the American Medical Association.

The Knott technique of ultraviolet blood irradiation is one of the most valuable developments in medicine in recent years. During the seven years that I have used it, I have had many occasions when everything else had failed or nothing could be done and death of a patient seemed inevitable, that blood irradiation has definitely brought about recovery. It is under such circumstances that its value can be most appreciated.

It is important to make very clear that the equipment used for this work by Dr. Wakim was equipment furnished to the Councils of the A. M. A. by the manufacturer for their use in the investigation of our work. This arrangement was made at the Mayo Clinic by the Councils at the suggestion of Dr. Krusen for their investigation. Before this work was started I was in Chicago and Mr. Carter told me of this arrangement, by Dr. Krusen, and said that he had been assured that our work would be duplicated and given impartial consideration. The statement by Dr. Wakim that Dr. Knott asked him to "find out whether this procedure really has a place in therapy," is misleading, as Dr. Knott went there to explain the use of the machine and suggest its use in the conditions in which we know it to be effective. We know this therapy is very valuable, and we hoped our work would be duplicated.

It is unfortunate that not one bit of work was done to investigate the vast amount of material which has been reported to the Councils in basic research and clinical evaluation. All of this material was made available to Dr. Wakim and Dr. Krusen and the Council's investigation SHOULD be to thoroughly explore the work reported, some of which has been referred to by Dr. Wakim in his paper. These include the following: First, it has been repeatedly shown that in certain pathologies, with a low blood oxygen, there is a marked increase of blood oxygen of 100 per cent to 200 per cent following ultraviolet blood irradiation. Also, that the phagocytic action of white cells is markedly increased from 50 per cent to 75 per cent following treatment. These two factors are very important in increasing the resistance of the individual. This procedure does not destroy infectious organisms or virus by direct action, but by the increased resistance of the patient. Second, in clinical studies with adequate controls this procedure has proven to be very valuable in septicemias, rheumatic fever in all its forms, virus diseases such as pneumonia and poliomyelitis, severe peritonitis and ileus, thrombophlebitis, and other conditions.

As to Dr. Wakim's work on distemper in dogs as reported, we are not told how the dogs were inoculated, or whether they acquired the disease in the normal manner. We are also not told whether these are alternate cases or selected cases. There were no postmortem reports as to the cause of death or the findings at the time of death. There is likewise no report of the number of treatments given. It is presumed that each dog received one treatment, and that each received a treatment consisting of 20 cc. of blood in ten sec-

onds, which is 25 per cent of the amount of treatment recommended. In seriously ill patients we usually give three or four treatments in as many days, so it seems that these dogs received less than 10 per cent of the treatment I would think necessary. It is most significant and that findings reported are not in agreement with this paper. Reports of other research and clinical work that are being done are most encouraging and the weight of clinical evidence is compelling a search for the proper answer.

Dr. Valentine (North Platte, Nebraska): The investigative study appears to me as too limited in scope; I have had some experience clinically with blood irradiation and consider the clinical entity of distemper as being primarily associated with veterinary practice.

Now, not as an M.D. but as one from the cattle country, I am well acquainted with the clinical course of distemper in animals and will agree that oftentimes comparative studies can be carried over from animals to humans. Having discussed the subject with my friends the local veterinarians, find them agreeing that it is perhaps a virus but also a mixed infection. The paper does not appear to give a definitive description of the organism study.

I should like to complement Dr. Wakim on the over all way that he has presented his investigation; his attention to detail has been excellent. I appreciate his compliments to the originator of the procedure, Dr. Knott, who is a physicist of wide experience.

Dr. Olney and I are from the same general community and I know from this indirect contact that he has carried on a well directed clinical application of this rather specialized type of ultra-violet light therapy. I have used the procedure clinically to a lesser degree but have found it singularly effective in certain types of cases. I feel that it has an overall place in treatment as a general supportive measure. This support is derived from a change that is little understood or recognized but I believe should be described on the basis of helio-therapy. On that basis I respectfully suggest that Dr. Wakim continue his investigation with the hope that we will learn more about the effect of light on living matter.

Dr. Lustig (New York, New York): Regardless of the controversy of the value of hemo-irradiation, I would like to ask Dr. Wakim whether there is still a place for hemo-irradiation considering the modern antibiotic therapy. The indications are mostly virus infections and septicemia, as I understand it.

Dr. D. S. Rausten (Lincoln, Nebraska): Dr. Olney is a friend of mine and a colleague in Lincoln; this problem of hemo-irradiation has been with us for quite a time, and these things have been presented in medical journals and also at meetings locally. In spite of being a friend of my colleague, I also have to be a personal friend to my patient; and, based on the practice of medicine, I have to follow certain scientific backgrounds in which I have been trained.

On the basis of these facts, I believe that hemo-irradiation has not established any specific evaluation of its therapeutic efficacy, but only has claims of assumption of merit.

I feel there should be more scientific data for evaluation of results rather than the so-called "claims of value" without adequate controls for judging results.

My other medical colleagues in Lincoln go along with the same attitude of thought as I have presented.

Dr. Khalil G. Wakim (Rochester, Minnesota): I will answer Dr. Olney's question. I was told by Dr. Knott himself that one treatment was sufficient. There are sufficient reports in the literature to indicate that one treatment is sufficient; so we gave only one treatment.

There was no choice in the matter of animals whatsoever. There were, let us say, 30 dogs taken with distemper in a natural manner, and no inoculations whatever were done. We took those 30 dogs and divided them into four groups. In fact, someone else did the dividing and we gave the treatment.

SEX DIFFERENCES IN REGISTRY EXAMINATION PERFORMANCE OF PHYSICAL THERAPISTS

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Theorizing about sex differences always presents intriguing problems. This is particularly true in the occupational world, and especially so in a field like physical therapy, in which workers of both sexes receive comparable training and perform essentially the same sorts of tasks on the job. There would undoubtedly be some "academic" value in establishment of real and significant sex differences in work performance if this were possible. Probably such information would have very real practical values as well, since training programs might be designed to exploit sex differences or different sorts of tasks could be assigned depending upon the sex of the worker.

In any attempts made to study differences among workers, whether differences be based upon sex or age or amount of training or experience or upon whatever variables seem worthy of being investigated, the first, and critical, decision which must be made is to determine the criterion to be used. It may be relatively easy to judge the success of groups of life insurance salesmen; the dollar value of policies sold becomes the criterion. For garment makers the numbers of items completed over a period of time may be considered at least a part-criterion. In these two instances there is a possibility of counting or measuring the products of the workers' efforts. These sorts of criteria tend to be rather reliable or consistent over periods of time, and often a considerable range of success as defined is discovered even among workers who are considered highly satisfactory on their jobs.

But how may we judge the success of physical therapists? Several years ago in an unpublished study by the writer an attempt was made to develop a means of determining differences in on-the-job performance. This study is believed to be the only large scale attempt to gauge success in this field of work. It failed miserably, because those who supervise the work done by therapists — who could best judge the quality and quantity of their work — seemed to feel they were rather uniformly successful on the job. No significant range of success was identifiable within the group of approximately 125 therapists for whom ratings were obtained.

Until adequate criteria become available, or until they are developed by methods requiring the expenditure of considerably more time and effort than it probably would be wise to spend, the scores earned on the Registry examination by applicants for registration with the ARPT may serve as one partial measure of success. This achievement examination has the advantage of being a highly reliable measure. Even for the quite homogeneous group of applicants the reliability coefficient (based on the Kuder-Richardson "foot-rule formula") is .89* for a random group of 200 cases. A further advantage is that scores of the examination are typically obtained right after formal training has been completed. The variable effects of experience, geographic location, adequacy of supervision, types of therapy performed, equipment

* This is a minimum value.

available, and the like can have relatively little effect on this measure of competence.

A major disadvantage of using the Registry examination as a measure of success is that it measures verbal knowledge of the field only. In the absence of other criteria, however, it would seem to be a useful assumption that therapists who know their field best should be better therapists than those whose knowledge may be more limited. To the extent that this is untrue, of course, the Registry examination may present a false picture of ability to work in the field. However, to assume that knowledge of the field and success in the field are unrelated seems untenable.

In the present investigation the total scores earned by 522 women and 286 men applicants to the Registry were compared. All were tested on the same form of the examination. Applicants trained at all approved schools were included; no selection of cases was made. Results of the investigation appear in table 1.

TABLE 1. — *Comparison of Registry Examination Scores Earned by Applicants of Both Sexes.*

	Female Applicants		Male Applicants
Number of cases	522	.....	286
Average (mean) score	177.25	.....	181.24
Difference between means	.....	3.99	.....
Standard deviation	31.89	.....	29.96
Standard error of mean	1.397	.....	1.774
Standard error of difference between means	.....	2.254	.....
"t" ratio (3.99/2.254)	.....	1.767*	.....
"F" ratio (df 521, 285)	.....	1.13*	.....

* Not significant at any usually acceptable level of confidence.

The statistic "t" is a ratio which, when compared with entries in standard tables of "t", enables the investigator to estimate the level of confidence with which he may accept or reject hypotheses about the groups under investigation. The data support the hypothesis that no significant difference between the sexes exists in so far as examination scores are concerned. Although the men applicants on the average score almost four points higher than the women, this difference could be attributable to chance factors sufficiently often to make assumptions about differences unwarranted. In other words the difference, as evaluated by usual significance tests, is not a significant one. This finding is, incidentally, typical of results obtained when measuring sex differences on many other kinds of verbal achievement tests.

It is sometimes felt that although perhaps the averages of two groups may be highly comparable, there might be much greater variability among the members of one group than among those of another. The "F" ratio provides a test of homogeneity of variances. Again, the data would indicate that the "spread" of knowledge of physical therapy as measured by the examination may be considered approximately equivalent for both sexes. This latter conclusion was further verified by testing the significance of differences between the standard deviations of the two groups by another formula described by Garrett.

Summary

In summary, then, it has been demonstrated that men and women therapists do not differ significantly with reference to the professional knowledge they possess if they are tested at a time when the maximum number of variables which could make for differences is controlled. Of course, it possibly

may be shown that in their performance on the job, evaluated after they have had experience, either sex may be superior to the other. If this is demonstrated, the subsequent superiority must relate to factors which operate after academic training is completed or to factors which are unrelated to academic training.

It may well be that so-called "personality" factors — difficult to describe or isolate, often existing almost solely in the eyes of the beholder, and usually virtually impossible to quantify or classify — may be of considerable importance to effective work in physical therapy. On purely theoretical grounds, however, it is to be expected that sex differences of this sort may not be clearly definable. Psychological research has demonstrated that for many variables differences among people in each sex are so much greater than differences between sexes that sound conclusions with reference to sex differences are difficult to establish.

The task of demonstrating superiority of one sex in comparison with the other, at whatever point in time after training has been completed, will be an extremely difficult one. The research will require careful definition of conditions to be investigated, adequate control of variables, highly reliable objective criteria, the elimination of sources of bias, and ingenuity of a high order.

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THE NEUROPSYCHIATRIC ASPECTS OF REHABILITATION *

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Psychiatrists and specialists in Physical Medicine are working on common ground, as far as objectives and even to some extent methods, are concerned. In psychiatry the rehabilitation of the unhappy, inept, discouraged and incapacitated psychotic or psychoneurotic patient is basically the chief concern; in physical medicine the rehabilitation of the physically crippled. Yet in both fields we are practicing a "comprehensive" type of medicine, utilizing techniques based as much on the art of medicine as on the science. Thus, as Howard Rusk[1,2] has put it in talking about this "third phase of medicine," we are both trying to help a human being "to live and work with what he has left," or, as is frequently the case in both fields: to live and work effectively without some of the faculties the normal person takes for granted. In some fields of medicine it is possible to treat only the patient's illness, letting the patient himself recover as best he can. An appendectomy performed by a surgeon who never again sees the patient may be very successful, and the patient is soon back on his feet. But in physical medicine and psychiatry we are particularly concerned with helping a sick or injured person recover from a long standing disability. And if we are going to work successfully in these fields our concern has to be the individual, more than his disease per se.

What, then, are the emotional problems the chronically ill or injured person has to face, and what effect are they likely to have on his rehabilitation? First are the problems that arise from the original impact of the illness or injury. Clinically this is where rehabilitation begins. If we wait until recovery is well underway before we start to work on rehabilitating our patient, not only do we lose valuable time but we may be faced with habits and attitudes which have developed during the early phases of hospitalization which make ultimate rehabilitation impossible or at best incomplete. As Karl Menninger[3] has phrased it, "Rehabilitation begins at the gate of the hospital." Thus, an amputee is not left to his own devices until his stump recovers sufficiently, and then suddenly taken out of bed, fitted with a prosthesis, and sent home. From the very beginning he is prepared physically and emotionally for ultimate rehabilitation. Actually Menninger's statement is only partially true. The ground work for successful rehabilitation is often laid years and decades before the onset of illness or injury. Success depends to some extent on the crippled person's inherent resources, physical and mental — on his capabilities before injury, capabilities arising from the way the patient was brought up and the way he learned to face new situations and traumas. These are factors beyond our immediate control, but they may be decisive in the outcome.

This brings us back to consideration of the original emotional impact of a disabling injury or illness on the patient. Destruction of a body part or

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* From the Colorado Psychopathic Hospital, University of Colorado Medical Center. Read before the 29th Annual Session, American Congress of Physical Medicine, September 5, 1951.

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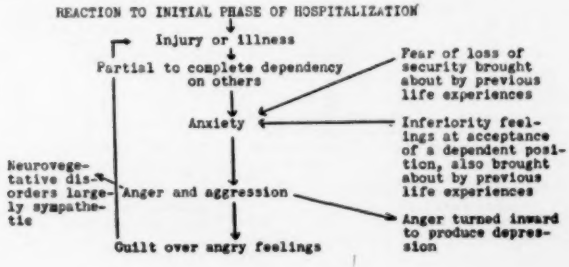
2. Rusk, H.: The Broadening Horizons of Rehabilitation and Physical Medicine, J. A. M. A. 30:26, 1949.
3. Menninger, K. A.: Mental Patients Predominate Here, Hospitals 20:44, 1946.

loss of specific abilities may give rise to tremendous fears, often apparently out of all proportion to the loss. Different people may react to the same injury in entirely different ways, depending largely on their previous life experiences. A self-centered school teacher may react to the loss of a leg much more adversely than a Colorado cowpuncher, even though the school teacher may retain his means of making a livelihood and the cowboy lose his. Thus arises the necessity for considering each person as an individual, reacting to trauma in his own individual way.

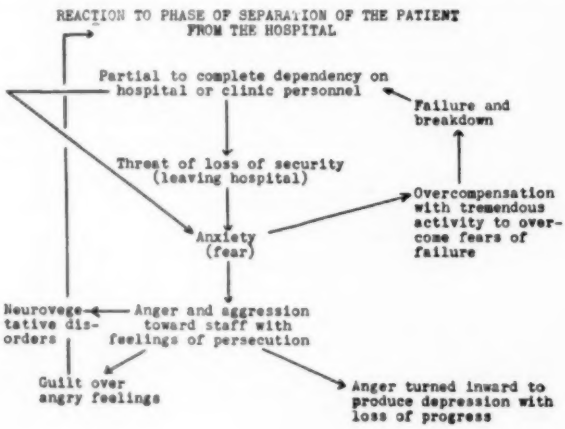
The prospect of long weeks and months in bed, the expense, the worries about one's family and other problems will give rise to tremendous anxiety in even the well integrated individual. To be completely dependent — to be actually at the mercy, as it were, of the physician, the physiotherapist, the nurse, may give rise to conflicts in the best adjusted of us. In growing up we learn how to deal with our need to depend on others, as we slowly emancipate ourselves from our parents we develop patterns of mutual dependency —on wives, husbands, children, associates. Most of us solve these problems fairly satisfactorily. But what happens when one is suddenly thrown into an almost infant-like situation of dependency? I believe this will be more clear to you if you think back on your own illness experiences, minor though they may be: how upset you were when the nurse neglected your morning bath, or the orderly forgot to remove your bed-pan, or your physician gave you an evasive answer, or failed to appear when you expected him. It goes almost without saying that a person suddenly thrown into such a position is going to become a very difficult management problem unless handled with consideration and understanding. To be dependent on someone who seems disinterested or who blows hot and cold can give rise to tremendous fear and anger which may stand in the way of the patient's progress.

One of the great problems faced in rehabilitation is the maintenance of a cooperative relationship between patient and physician, patient and therapist, and others, over long periods of time. Thus arises the necessity of starting out right with the patient. No time is more important in establishing this relationship than in the inital stages of his illness. A common mistake at this period is to appear too busy to be able to spend any time with the patient. This is particularly bad at the time of the initial contact, at the time of the patient's admission to the hospital. To allow him to talk frankly with you, to discharge some of his pent-up feelings, may do a great deal to cement the relationship which will give him the willingness to carry on toward recovery despite disheartening setbacks. I think we are all aware of the importance of the doctor-patient relationship and the same thing applies to the physiotherapist — patient or nurse — patient relationship. It is not necessary to talk in terms of transference and counter transference, as we do in psychiatry to appreciate the importance of this. An outline of some of the


REACTION TO INITIAL PHASE OF HOSPITALIZATION
Injury or illness
Partial to complete dependency on others
Fear of loss of security brought about by previous life experiences
Anxiety
Inferiority feelings at acceptance of a dependent position, also brought about by previous life experiences
Neurovegetative disorders largely sympathetic
Anger and aggression
Anger turned inward to produce depression
Guilt over angry feelings

difficulties occurring during the initial phase of hospitalization might be made as follows:

I now skip over to the opposite end of the hospital period — the time before discharge, when we find our patients faced with other problems. Actually, if the patient has been well handled initially these problems may be quite minimal. If we have handled things poorly, they may interfere critically with a successful outcome. A great many patients have come to depend on the security of the hospital and the relationships they have made there. Frequently these relationships have been more satisfactory than any before their illness. Thus, many conflicts may arise in a patient facing the prospect of again returning to the outside world with all its competitions, lack of appreciation of the handicapped person's problems and lack of special attention. The patient may react to this conflict between desiring to be independent again vs. desiring to remain dependent and secure in the hospital in a number of ways: (1) He may become extremely angry toward the people he fears are rejecting him. The reasons behind his anger may not be readily apparent to him. He may feel vaguely persecuted and view attempts to rehabilitate him as a desire to get him out of the hospital to make bed space for others, or because the doctors have given up hope of really helping him further. (2) He may suddenly stop progressing and even fall back. This may be due to turning his anger against himself which usually results in depression. (3) He may develop all sorts of vague somatic complaints. Very frequently these will be related to his injured parts and prosthesis. On the other hand they may take the form of vague malaise, headaches, dizziness, weakness, etc. (4) Occasionally we may see a patient who overcompensates for his anxieties about leaving and his fears of failure. He pushes himself unmercifully and sets impossible goals. He may also set unrealistic vocational plans for himself and be upset because he is not encouraged in these. This type of over-reaction can be handled to advantage, but we should be on our guard against viewing it as normal and healthy. It may lead to discouraging set-backs. In people with tuberculosis it is a reaction that often leads to early and serious breakdowns. A summary of some of the reactions to this phase of separation from the hospital may be outlined as follows:


REACTION TO PHASE OF SEPARATION OF THE PATIENT FROM THE HOSPITAL
Partial to complete dependency on hospital or clinic personnel
Failure and breakdown
Threat of loss of security (leaving hospital)
Overcompensation with tremendous activity to overcome fears of failure
Anxiety (fear)
Neurovegetative disorders
Anger and aggression toward staff with feelings of persecution
Guilt over angry feelings
Anger turned inward to produce depression with loss of progress

It should be emphasized that these reactions to the prospects of leaving the hospital are generally not conscious attempts on the patient's part to sabotage rehabilitation. For the physician to react to them in that manner makes him as unreasonable as the patient showing this behavior. Actually, these reactions are not unlike those of a child learning to grow up. They are neurotic, yes, in the sense that they are unrealistic; but they are readily understandable in terms of child-like behavior. In treating the neurotic we are in many ways treating the child in the adult. And so it is here. We are dealing with childlike and largely unconscious reactions to threatened loss of security; that is, to separation from the hospital. If we remember this and react accordingly, we can readily help our patients to grow up, and to understand and overcome these psychological pitfalls in the rehabilitation process.

This leads to my main theme: that most of these psychological problems in rehabilitation of the physically handicapped are readily understandable and can be best handled by the physicians and therapists in immediate charge of the patient. After all, it is easier for a patient to confide in those he has known and in whom he has confidence, rather than in a third person — a stranger. When psychological problems arise, as they inevitably do, there is usually no need to rush the patient to a psychiatrist. That is carrying specialization to an absurd extreme, and it is not doing the best thing for the patient. He may interpret it as meaning that the doctor is fed up with him, doesn't understand him or is trying to pass him off on someone else. When this unhappy patient gets to the psychiatrist he is an almost impossible problem to handle. Thus, what could and should have been handled effectively by the physician in charge has suddenly become an impossible situation — a vexing problem for the patient's doctor, the psychiatrist and most of all for the patient.

By this I don't wish to imply that there are not patients who should receive specialized psychiatric attention; of course, there are. The point I do wish to make is that a good working relationship between the patient and his doctor and therapist is the most satisfactory answer in most cases. For this reason it is frequently preferable to work, as psychiatrist, through the physicians and physiotherapists and social workers on the service. Coleman, Hurst and Hornbein[4,5] have aptly called this "staff-centered" psychiatric service. Thus, if the psychiatrist can be readily available to discuss day-to-day psychological problems of patients with the staff of a rehabilitation service as well as attending staff conferences and rounds to offer suggestions, a great deal more can be accomplished, not only for the patient's good, but also from the standpoint of training the newer personnel in problems of practical psychological management.

In discussing the problem of handling the rehabilitation of the chronically ill and injured the social worker is important. Not only can the worker be of great help in aiding the patient in dealing with pressing financial and family problems but in this same capacity may be of tremendous value in helping the patient in handling his psychological problems, many of these connected with these outside social and financial difficulties. It may actually be the social worker who will, by his close initial contact with the patient, recognize the need for more extensive psychiatric care for the patient, long before his psychological difficulties have shown up clinically to complicate the rehabilitation program. Thus, in a smoothly functioning program a certain amount of preventive or prophylactic psychiatry may be practiced.

4. Coleman, J. V.; Hurst, A., and Hornbein, R.: Psychiatric Contributions to Care of Tuberculosis Patients, J. A. M. A. 135:699, 1947.
5. Hurst, A.; Coleman, J. V., and Hornbein, R.: The Place of Psychiatry in the Program of a Tuberculosis Hospital, Dis. of Chest 15:581, 1949.

As has been indicated, there are some patients whose psychological problems are deep-seated and disabling that they will require the direct services of the psychiatrist. When this is the case it is of greatest importance to have the referral properly made. A poor referral may destroy completely the chances of giving the patient adequate psychiatric care. A few worthwhile suggestions are: (1) Give the patient a chance to talk to you concerning his emotional problems and then, after indicating your understanding of his difficulties, the suggestion of psychiatric care may be offered. (2) It is important not to make a forced referral. Indicate it is something you feel advisable for the patient's welfare, but not mandatory. (3) Try to show the patient your continued interest so that he doesn't interpret referral as a "brush-off." (4) Give him a chance to express to you his ambivalent and often angry feelings about being referred. Don't shy away from accepting his anger and dealing with it. It is thus obvious that an adequate referral can only come from a physician who already has a good understanding of the patient and a close working relationship with him. From our standpoint we can help by talking with the referring physician before discussing the advisability of referral and suggesting special means of handling it. We can also be helpful by working closely with the rest of the rehabilitation team on the wards, during rounds and in the clinic, so that the patients themselves come to see that the psychiatrist is really just another member of the team.

Working with the physical medicine specialist in this common sense and straight forward manner, psychiatrists can contribute concretely toward helping the chronically disabled to a more complete and successful rehabilitation.

Discussion

Dr. George G. Deaver (New York, N. Y.): It is most gratifying to be asked to discuss this down-to-earth, practical presentation by Dr. Ebaugh.

I don't think there is any doubt in the minds of any of us who have been working with rehabilitation, concerning the importance of treating the emotional traumas of the disabled people as well as the physical disability. We must do this if we are to have any successful rehabilitation program.

Dr. Ebaugh emphasizes the importance of starting rehabilitation early. We frequently see the results of failure to do this, especially in our hemiplegia patients. We will have a married man who has suddenly had a stroke. His whole picture changes, when he is taken to a hospital, where the nurses wait on him. His wife's whole attitude changes, and she immediately says, "What can I do for you, John?" After a few weeks the patient is sent home with instructions from the doctor to take it easy.

To start a rehabilitation program at that point is very difficult, because the patient thinks, "This is wonderful. My wife is waiting on me; my married children, who never came to see me, now come to see me every week. What's the use of getting well."

If we start our programs early so that the patient thinks that rehabilitation is simply a part of our rehabilitation program, many of these emotional problems can be overcome. The suggestion that Dr. Ebaugh made, that the prospect of long weeks and months in bed, and the expense, and the worry about one's family, and other problems giving rise to tremendous emotion, are facts that all of us must realize.

One large insurance company is now hiring physical therapists, nurses and occupational therapists as liaison officers of the company. As soon as a man has an injury they visit the family; they visit the man in the hospital, and his employer, and tell the patient that the problems at home are taken care of, and that compensation is now being paid to the family. They arrange for a visit from his boss, and the boss wants to know how the man is and when he can come back to work. They are all planning a rehabilitation program for him.

This type of service is another thing that can relieve him of his emotional problems.

In any program of rehabilitation, when we try to teach people to do something for themselves — to walk and take care of themselves and regain their speech, mutual activity should be stressed. I like the 3-A slogan that we use so much: Action Absorbs Anxiety. If we can get people out of bed and on their feet, have them start doing things for themselves, and work with them, to convince them that we are interested, much of their anxiety can be overcome.

I should like to emphasize the point Dr. Ebaugh made, that the best method of utilizing a psychiatrist is to have him available from day to day to discuss the psychological problems of patients with the staff, and that this is the best method of handling the psychological problem.

We have found that true in our Institute of Rehabilitation, where we have a full-time psychiatrist. Every time we evaluate

a patient he is the one who tells us about the problems of the individual concerned. He can tell us methods of handling cases of the malingerer — the person who has an hysteria, a neurotic patient, or whether we are dealing with a psychotic patient. We have been told several times that we should not even try to rehabilitate a patient of a disability, because of the psychological problems and personality; if you treat the disability and cure him, he will develop something that may be much worse.

Having a psychiatrist around to help out and to point out how we should handle our patients is important. I wish to thank Dr. Ebaugh for bringing to our attention the place of the neuropsychiatrist on the rehabilitation team, for emphasizing that the physiatrist and therapist, who have the immediate charge of the patient, with proper guidance can best handle many of the psychological problems which may arise.

Dr. B. L. Boynton (Houston, Texas): For over a year at our institution we have had an attending neuropsychiatrist as part of our rehabilitation staff. The psychiatrist and the clinical psychologist, working together with us as a team, have given us basic fundamental information regarding our attitude toward the patient, which in my opinion is of great importance; then they have helped us to understand the patient's problem from his point of view, which is most important.

I would like to take this occasion to brag. There are three physicians on my staff, and for the past ten months there hasn't been one patient at whom we have gotten "mad." I think that is an accomplishment that we owe to the psychiatrist.

EXERCISES FOLLOWING THE BANKART OPERATION FOR RECURRENT SHOULDER DISLOCATION *

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The object of the study represented by this paper was to determine whether postoperative exercises for recurrent shoulder dislocations had resulted in an earlier increase in the range of shoulder motion, greater improvement in gains in strength and a decrease in the length of the average recovery period in comparison with cases which did not receive similar supervised activity.

In the Naval hospital patients were returned to full duty immediately after hospitalization was completed. An accelerated activity schedule was given them after the Bankart* operation. This took place under closer supervision and for a longer time than was permitted for patients of the non-military institution which were used for comparison.

In the military hospital about two and one-half weeks after operation the Velpeau bandage was removed and the patient was given his first shoulder activity on the ward. Codman's stooping exercises were started. The principle of these exercises[1] is that they allow the patient to abduct the arm with the aid of gravity and so need no fulcrum either on the glenoid or the acromion or both. Since, in the stooping position no fulcrum is necessary, either lateral or antero-posterior motions can be done with a pendulum-like move-

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* Bankart, A. S. B.: Operation for Recurrent Shoulder Dislocation, Brit. M. J. 2:1132.

1. Codman, E. A.: The Shoulder. Thomas Todd Co., Printers, Boston, Mass., 1934, p. 202.

ment without much muscular effort. In this position the weight of the arm actually helps to stretch the contracted tissue of the shoulder joint.

A series of sixteen cases, at the Naval hospital, were referred to the Rehabilitation Section only 3.4 weeks after operation for the recurrent dislocations. A series of 24 cases, from the non-military hospital, were not exercised under supervision in a Physical Medicine Department.

In the non-military group the patient left the hospital as soon as the wound had healed and the stitches were out. General shoulder exercises were advised, on an out-patient basis, on an average of 4.4 weeks post-operatively. The individual would report back to the follow-up clinic for examination and instruction regarding the type and extent of activity. Since the main objective at this hospital is to get the patient out after operation as quickly as possible, with maximum benefit, a shorter stay is imperative and little or no daily, progressive, supervised corrective therapy can be administered.

In the military hospital the sixteen cases were given early and intensive work on a definite exercise program. The importance of full range of motion was first stressed and then increase in the strength of the shoulder joint musculature was sought. In comparing the results of those who had the exercises with those who had no definite plan or supervision it was found that the former regained range of motion and strength sooner and returned to duty earlier. After three weeks in physical medicine activities most of the supervised group could raise 50 to 75 pounds or more over their heads with the "two-hands press." The patients on a definite program were sent to the corrective therapy section earlier and, on the average, it required less than *two and a half months* after the operation for them to reach a maximum range of motion. They were able to return to full duty. This is compared to an average of *five months* for those who were not on a definite planned program.

The military patients who were exercised daily, reported to the Rehabilitation Therapy Section wearing a simple sling. At this time the initial comparison measurements were taken to determine the range of shoulder motion. The routine Codman stooping exercises had previously been started

Fig. 1.

on the ward by the orthopedist, about two and one-half weeks postoperatively. Following this, in the Physical Medicine Department, heat, massage, the Hubbard tank and increased pendulum activity, with the addition of other shoulder

exercises, were stressed for at least one-half hour in the morning and one-half hour in the afternoon.

Outline of Activities

First Ten Days. — Codmans' stooping exercises. Hubbard tank for relaxed swimming strokes. Hand exercises with both hands. A ceiling pulley for active assistive exercises. Shoulder exercises with light weights. Shoulder wheel without resistance. Shoulder ladder. Floor pulley (Fig. 1) supine, on a plinth, with stretch in elevation, abduction and external rotation to tolerance.

Tenth to Twenty-First Day. — Resistance bolt on the shoulder wheel is tightened. Supervised punching bag exercises are begun. Wall pulleys with weights are used. Later, increased activity with Sargent weights, the punching bag and weight lifting is stressed.

Fig. 2.

By the end of the fifth week many of the patients can lift from 50 to 100 pound weights over their head and do many push-ups. They have strong forward flexion, fair abduction and external rotation and the expected good internal rotation (Fig. 2).

Comment

It can be safely stated that most individuals sent home to do postoperative shoulder exercises do not do daily, progressively increasing, activity. They neglect many of their exercises and substitute muscles that are not to be used. They have no facilities for wall or ceiling pulleys or the other useful equipment found in most well equipped physical medicine departments. They fail to remember many of the instructions given them describing motions needed for increasing and strengthening the shoulder girdle.

An outstanding example is a patient who was told to exercise but who stated (after more than ten months had elapsed since a Bankart operation) that he did not know he was supposed to raise his arm over his head. He had had the impression that he was to carry the arm down and "always to favor it."

Many of the patients were seen and treated in the rehabilitation section. Much of the information that was gathered was evaluated from hospital records. A sincere effort was made to have the conclusions drawn as fair and as statistically correct as possible.

Summary

A group of sixteen cases exercised, under supervision, and a group of twenty-four cases advised to exercise, on an out-patient basis, were studied. The former group were sent to a physical medicine department earlier for treatment and were returned to duty earlier. It took only two and a half months for return to duty by the supervised group compared to five months for those individuals who were told to do shoulder exercises at home.

A planned program of supervised activity in postoperative Bankart cases resulted, in sixteen of our series of forty cases, in better shoulder motion and strength as well as a quicker return to duty than "exercise-advice" without daily supervision.

Discussion

Dr. W. B. Snow (New York City): The authors of this paper have brought to the fore several important facts which are always a consideration in post-traumatic joint rehabilitation. The earlier the mobilization can safely be instituted the faster and more complete will be the re-establishment of range of motion and muscle power. In any exercise therapy there should be a definite plan of treatment, a definite goal, and an orderly progressive sequence of exercises stepped up consistent with return of function. The patient should be told the reason and the plan for this exercise therapy. Best results in traumatic injury are to be obtained when an integrated plan between the surgeon and the physical medicine service is arrived at. Also it is important to know the extent, the pathology, and mechanism of the injury, and the surgery performed, if physical medicine is to be applied most efficaciously. In the case of recurrent dislocations of the shoulder, there are several types of operations which are popularly used. These are mainly repair to reduce laxness of the capsule of the joint and retain the humeral head in the glenoid fossa. These operations are such as the tenosuspension procedure in which section of the perineus longus tendon is threaded through holes drilled through the acromion and the tuberosity of the humerus. In the Cole operation where the tendon of the long head of the bicep is utilized and passed through a hole drilled diagonally upward through the humeral tuberosity, shortened and secured, with suspension of the humerus. The Bankhart operation is based upon the concept that in most traumatic dislocations of the shoulder as the humeral head descends during the dislocation the capsule is torn with or without fracture of the glenoid labium from the anterior portion of the glenoid cavity. The shoulder capsule itself is unusually lax and depends for strength on the synchronized muscle folds about the shoulder. The weak portion, and the one where rupture usually occurs, lies between the insertion of the subscapularis and the origin of the triceps on the lower glenoid margin. Recurrent dislocations are most common when the shoulder is extended, pronated, and abducted at one time as in reaching the extended arm over a barrier. Likewise, these may occur if the arm is in such position as is assumed in hanging on a bus strap, and some external rotation is produced when the bus lurches. The Bankhart operation is a more formidable procedure than the others mentioned. It consists of sewing the detached glenoid lip back in place along with the capsule to the lower glenoid margin resulting in a very complete repair. In orthopedic circles in recent years, there has been a gradual increase in the number of such procedures carried out. Not to detract from the authors' work, I would say that they start out on their exercise routine with a distinct head start to good function due to the Bankhart operation procedure. The exercises as, in tendon repairs, are not started until the danger of gelatinous union is passed. The authors have accumulated a well worked out group of exercises to accomplish their ends. These exercises strengthen the subscapularis, teres major, anterior deltoid, pectoral major, latissimus dorsi. Bowling might be added as a reasonably early recreative exercise and the use of golf clubs would likewise be reasonable as soon as range of motion is better established. Neither of these, if we analyze the kinesiology, would carry much hazard. Comparison of these two groups of cases stresses the importance of coordinated interest of the surgical and physical medical services. It is interesting that no consideration was given in any of these cases to brachial plexus injuries in shoulder dislocations.

Dr. Rudd (closing): Dr. Snow filled in with a lot of information that I omitted (which was important) but for which I did not have time. I want to bring out this point: many of the exercises are standard shoulder procedures which have proved useful, for example, in cases of bursitis, after reductions of fractures, etc. The chief stress in this paper is on the rapidity of the progression of the exercises and on the opportunity to compare the results of those who had received and those who had not received this activity under supervision.

At a symposium on "Recurring Shoulder Dislocation," presented before the British Orthopaedic Association in London, October, 1947, Dr. Reginald Watson-Jones said that there was only a single failure in 52 operations and he felt that was due to a superior approach to the shoulder in-

stead of the anterior exposure, capsular reefing, and shortening of the subscapularis muscle. He said that the success of the Bankart operation depends not only on repair of the labrial defect but on necessary resuture of the capsule. Thus the capsule is shortened and external rotation is limited.

J. Crawford Adams, at the same symposium, said that the average range of external rotation is 51 degrees and abduction is 166 degrees. This is of especial interest since it has been said that unless there is full external rotation of the humerus it is not possible to do more than 90 degrees of abduction.

NEW DEVELOPMENTS IN AMPUTEE REHABILITATION *

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It seems rather ironical that most advances in amputation surgery and in the development of prosthetic devices in modern times have taken place during and immediately following a major war. The casualties resulting from the Civil War gave great impetus to the development of the artificial limb industry and led to the establishment of many small artificial limb shops, usually conducted by amputees themselves.

Renewed interest in amputations occurred in World War I and led to many new developments. Norman H. Kirk's efforts to improve the care of amputees were well recognized and eventually led to his appointment as Surgeon General of the Army, in which capacity he inaugurated the outstanding program of amputee care in World War II. This included the policy of doing only open, or guillotine amputations, in field or station hospitals, postponing all definitive surgery such as stump revisions or closed amputations at the site of election to be done only in established amputation centers by skilled, experienced surgeons. Thus much valuable limb length was saved, and often many a life. In addition, an adequate program of after care, including prosthetic fitting, training and other rehabilitation techniques was established in these military amputation centers.

Rehabilitation of the amputee can be divided into four phases, each of which constitutes an essential step in the successful use of his prosthesis and in adjustment to his handicap. The various procedures essential to these four steps represent the combined talents of many highly trained and experienced persons, including physicians, nurses, training therapists, limb makers, social workers, vocational counselors, all working as a team in a closely integrated program designed to speed recovery of the amputee and his return to normal living.

The four phases are (1) surgical considerations, including immediate post operative care; (2) selection and fitting of the prosthesis; (3) training in use of the prosthesis; (4) emotional and social adjustment. In the past little attention has been paid to most of these considerations by the medical profession and even now they are little understood and often neglected.

Surgical Considerations

The final condition of the stump plays a very important part in the successful fitting and use of the prosthesis; the surgeon in planning and performing the amputation should give careful consideration to the functional and prosthetic requirements of the stump, choosing the optimum site of amputation

* Read at the Twenty-Ninth Annual Session of the American Congress of Physical Medicine, Denver, Colo., Sept. 6, 1951.

and fashioning the stump end in a manner best suited for efficient and comfortable use.

It is often evident that certain difficulties encountered in prosthetic fitting might well have been avoided by a more thoughtful consideration and analysis on the part of the surgeon at the time of amputation of the prosthetic requirements of the stump. For example, the above knee stump best adapted to the fitting of the suction socket should be cylindrical rather than conical in shape, and the aponeurosis and tendons of apposed severed muscle groups should be loosely sutured over the bone end rather than being allowed to retract.

The after-care, which includes the preparation of the stump for the prosthesis, is most important and is often neglected by the surgeon. The stump, which at first is swollen, flabby and bulky, must be remodeled and shrunk by proper bandaging until it is firm and tapering. The bandaging technique must be carried out meticulously, for if faultily done it is worse than useless and may even do harm. Also an essential part of the preparation of the stump for the prosthesis is a rigid program of daily exercises to improve muscle tone and body balance and to prevent contractures and deformities. Failure to carry out these important postoperative procedures results in prolonged and unnecessary delay in fitting the prosthesis and may even permanently handicap the amputee in efficient use of his prosthesis.

Selection and Fitting of the Prosthesis

The physician has a real responsibility as to advising the amputee in selecting his prosthesis, in supervising its fitting and in directing training in its use.

Within certain limitations there is a much wider range of selectivity in artificial limbs than is generally realized, and it is most important that great care and judgment be exercised in advising the amputee in his selection. Each amputee offers an individual problem and many factors must be taken into consideration other than the site of amputation: age, sex, physical condition, education, occupation, social and economic status, and mental attitudes are all important considerations.

The loss of a limb is often followed by a feeling of extreme frustration and most amputees need some help in combating this situation. The amputee must be encouraged in every way, and the possibilities of leading a normal life should be emphasized; but he must also face the situation realistically and make every effort to adjust himself to his handicap. He should be encouraged by all means to secure a prosthesis, properly selected for his individual needs, and to persevere in learning to master it. On the other hand, it is a serious mistake to promise too much. Great damage is done by arousing false hopes and promising results that can never be attained. Never should the temptation to encourage or cheer an amputee go to the length of leading him to think that he can achieve something that may be impossible for him. It is essential therefore, that the many limitations of the prosthesis as well as its possibilities, be carefully pointed out to the amputee frankly and clearly at the very beginning. Great harm has been done in the past by well-meaning, but over-zealous and exceptionally skilled limb-wearers who demonstrate amazing feats far beyond the capacity of the average amputee, thus fostering the mistaken hope that the new amputee can do the same.

Instruction and Training

Only in recent years has the importance of training the amputee in the use of his prosthesis been appreciated. With the lower extremity amputation, not only are active exercises necessary but careful instruction and per-

sistent practice in proper gait and posture are essential. This is designed to prevent muscle and joint contracture and deformity, to increase muscle strength and develop coordination and balance. With the upper extremity prosthesis, the amputee requires thorough instruction, long practice and perseverance if he is to master its use. The artificial arm is only a tool and the amputee must learn to use it as one learns to use any sort of tool. No prosthesis, no matter how skillfully constructed or fitted, ever functions by itself; its value lies entirely in the ability of the amputee to learn to use it. Great advances have been made recently in the development of new training techniques for both upper and lower extremity amputees.

Research and Development

The Committee on Prosthetic Devices (now called the Advisory Committee on Artificial Limbs) was established in April, 1945, by the National Research Council at the request of the Surgeon General of the Army. The function of the committee as stated was:

> The inauguration and administration of a program of research and development aimed at the improvement of artificial limbs.*

This marked a most significant advance as the need for fundamental research in this field was well recognized by both the limb manufacturing industry and the medical profession. As stated by Dr. Craig Taylor — "the whole program is dedicated to the premise that the amputee shall have the best devices possible from the standpoint of function, comfort and appearance." The research studies have included chiefly two basic projects, namely: (1) Fundamental studies pertaining to gait, motion, and other phases of muscle physiology as related to amputations, and (2) Development and improvement of prosthetic devices.

New Devices

Some of the more important devices which have been developed to the point where they have been released by the committee and made available to the limb industry are briefly described as follows:

Suction Socket. — The suction socket above-knee prosthesis, first developed in Germany, differs from the conventional leg in that it has no pelvic hinge or suspension harness. The leg is held on by moderate suction created in the closed socket each time the leg is lifted from the ground, plus the friction produced by the contracting muscles of the stump against the sides of the socket. It is a truly stump-controlled prosthesis; obviates the discomfort and inconvenience of the pelvic hinge and belt, feels more like an integral part of the body, and permits greater freedom of motion in all directions. Accurate fitting and alignment are indispensable for its successful use, and intensive instruction and training in its use are most desirable. Generally speaking the properly fitted suction socket prosthesis is unexcelled for the above-knee amputee and represents a great advance in prostheses for amputations of the lower extremity.

Artificial Arms. — Material advances in the design and construction of upper extremity prostheses have been made by the A. C. A. L. Construction materials, such as low-pressure laminated plastics and light weight aluminum alloys, have been carefully tested and selected for their maximum strength and minimum weight characteristics. The plastic sockets are molded over plaster of paris models of the stump, carefully fashioned so that the finished socket accurately fits the contours of the stump with comfort and stability.

* Research Reports on Artificial Limbs. Committee on Prosthetic Devices, National Research Council, Evanston, Ill., 1946.

In the above elbow prosthesis, the new types of mechanical elbow joints equipped with shoulder-shrug actuated elbow-locking mechanisms, and a turntable which permits rotation of the forearm section about the long axis of the stump, also represent some of the new devices that are of great advantage to the upper arm amputee. Careful studies have also been conducted to determine the most efficient methods of harnessing and control of the prosthesis, with great benefit to the amputee. Only recently has the importance of proper harnessing been recognized.

Terminal Devices. — These are so called because they attach to the end of the prosthesis and substitute for the hand. Those in most common use are the light dress, or cosmetic hand, which has little or no function, and the mechanical hand and utility hook; both of these have grasping power activated by muscles elsewhere in the body, usually from the opposite shoulder. They are controlled by webbing harness and cables of metal, leather, or nylon.

A recent advance, developed under the auspices of the A. C. A. L. for control of the terminal device, is the use of a stainless steel cable encased within a stainless steel spring-wound housing. This cable has many advantages over the conventional leather thong control used in the past.

These mechanical hands and hooks are of two general types, differing from each other in the mechanism of the opening and closing device. One is called the "voluntary closure" or "voluntary-muscle-control" type, in which the fingers are held open by a light spring and are closed by voluntary muscle control through the harness and cable. The other type, which is termed the "voluntary opening" or "spring tension," is held in a closed position by means of a strong spring, or, as in the case of the conventional hook, by means of rubber bands passed about the base of the two fingers, and is opened by tightening the control cable.

The Army Prosthetic Research Laboratory has developed a new hook and a new hand, which appear to have certain definite advantages over the conventional devices now in common use. They are of the "voluntary closure" type and are interchangeable on the wrist plate of the prosthesis so that either can be worn as desired. They are equipped with a self-locking device, or clutch, which allows the fingers to be closed and locked automatically in any position and with exactly the required tension necessary to grasp the object firmly. This allows a very accurate and delicate control in grasping objects of various size, shape and density. The first pull of the control cord closes the fingers, which automatically lock in position about the object grasped when the pull is released. The second pull releases the locking mechanism and the fingers then open automatically by means of a spring incorporated within a housing at the base of the terminal device. The APRL hand is covered with a special cosmetic skin glove which resembles to a fair degree the natural skin.

These represent just a few of the new devices being developed under the research program of the A. C. A. L. The program continues, and many new projects which promise much for the future are now under way.

Teamwork in the Rehabilitation of the Amputee

Another very significant improvement in service to the amputee is the development of a spirit of teamwork among those concerned with his problem. The surgeon is beginning to realize that treatment of the amputee does not end when the wound is healed, and is appreciating more and more the importance of post-operative preparation of the stump, the necessity of advising the amputee in the selection of his prosthesis and of supervising its fitting and training in its use.

More and more effort is being made to give therapists the opportunity to work with amputees so that they may gain experience in proper training methods in gait, posture and the most efficient use of the prosthesis. At the present time such experience is available only in a few well-organized rehabilitation centers. Vocational counselors, social workers, welfare and governmental agencies who purchase artificial limbs are beginning to recognize the necessity for careful selection of the device best suited for the amputee's individual needs, regardless of price, and for good fitting and training, instead of purchasing the appliance in the open market from the lowest bidder without consideration of indications or quality of service.

The prosthetic clinics recently inaugurated by the Veterans Administration furnish a good example of this sort of teamwork in action.

One of the most significant developments that has taken place in recent years is the commendable change in attitude and philosophy evidenced by members of the artificial limb industry. This has been demonstrated by the gradual development of a truly professional attitude toward their work and in their relationship with the physician and the amputee. More and more emphasis is being placed on rendering a service rather than selling a product. This change has resulted in an awakening sense of professional responsibility stimulating a keen desire for more knowledge and training. The voluntary establishment by the limb and appliance industry of a Board of Certification to set up standards of qualification and training for their members is a concrete example of this change in attitude. Through the impetus of this board and other far-sighted members of the industry and other interested groups, special schools and training courses have been conducted and enthusiastically attended by these craftsmen. As Chester C. Haddan* recently stated: "Never before has modern history seen a similar example of an entire industry going to school."

All of these advances are very encouraging and mark great progress in service to the amputee, but much more needs to be accomplished and the responsibility for this now rests largely with the medical profession. In spite of the improved prosthetic devices and advances in training techniques, and the increased interest in amputee care, a large number of physicians who perform amputations and care for them afterwards still manifest little concern in the problem and evidence a woeful lack of understanding and appreciation of the importance of proper care and supervision following amputation.

This deficiency constitutes a real challenge to the medical profession and can be solved only by improving our teaching methods. Organized courses including the study of prosthetic devices and orthopedic appliances as well as other rehabilitation techniques, should be added to the curricula of medical schools both on the undergraduate as well as the graduate level. Such courses, made up of lectures, clinical demonstrations, and even shop work under the direction of qualified appliance makers, should be required of all residents in orthopedic surgery, general surgery, and physical medicine. In spite of the tremendous advances made in rehabilitation of the amputee, not until medical schools accept this sort of teaching responsibility will the civilian amputee receive the type of care and service he deserves.

Discussion

Dr. Odon F. von Werssowetz (Nashville, Tennessee): Before commencing this discussion, may I express our indebtedness to Dr. Thomas for placing before us the benefits of his many years of experience in orthopedic surgery, especially in the amputation and prosthetic fields. His paper brings to us the new major developments in the field of the rehabilitation of amputees.

The rehabilitation process should start at or before the time of the amputation.

* Haddan, C. C.: Present Prosthetic Practices, Jour. O. A. L. M. A., Washington, May, 1951.

When the amputation is carried out, it begins a completely new period in the life of the patient. He finds himself, rather abruptly, in a new position and unfamiliar circumstances. He is lost and helpless. He seeks guidance and needs complete rehabilitation. It is gratifying to note that the total rehabilitation of the amputee is being accepted as the ultimate goal of recovery. A few years ago, it was generally found that this goal was only the healing of the stump.

The total rehabilitation of the amputee, as Dr. Thomas so aptly expressed it, is the result of teamwork of numerous workers, each skilled in his own field, working together in harmony for the patient and with the patient to achieve the maximal functional, social, and vocational recovery of which the patient may be capable. It must be borne in mind that an amputee is a completely coordinated human being, who has lost a limb. He has certain complex and individual physiological, neurological, and psychological characteristics which are inherent to himself and govern his thinking and actions. The lost limb was a part of this process and was used in many voluntary and involuntary acts, which now he may lack. He has to develop new patterns, new reflexes, and new mental balance. To obtain successful results, it is essential that the physician or surgeon in charge prescribe the various procedures in a thoughtful and scientific manner. Because this rehabilitation process is slow, having numerous ramifications, it is becoming more acceptable that a qualified physiatrist, if available, take charge of the patient after final surgical procedures have been completed. This is especially true in our Service Hospitals.

As Dr Thomas pointed out, there is an increasingly greater cooperation between the physician and the artificial limb maker. It is coming to be accepted that prostheses should be provided or sold by the limb maker only on a proper medical prescription. The objective of such a prescription is to fit the amputee with a prosthesis which will meet his requirements as completely as possible. This is especially important in the selection of an upper extremity prosthesis. The physician in charge of the case should make the selection. He cannot and must not delegate this to the limb maker. The physician should give accurate and detailed instructions. The limb maker, like the pharmacist, is highly skilled in technical matters but is untrained medically to evaluate all existing disabilities and to foresee possible complications. To obtain successful results, it is essential that the physician prescribing such a prosthesis have a thorough knowledge of the potentialities and limitations of each of the different types of devices available on the market, utilizing effectively all new improvements as they become of proved value. New or improved devices require new procedures in training. The physician should be familiar with them and prescribe such to meet the needs of the amputee.

The major effort in the development of new devices has been undertaken by the government's artificial limb program, under the coordination of the Advisory Committee on Artificial Limbs of the National Research Council, which is sponsored by the Veterans Administration. So far, the major achievements of this research are—the suction socket A/K prosthesis, the APRL hook and hand, a new type of upper extremity prosthesis, and new methods for their harnessing. The Air Force has sponsored work on the hydraulic knee. So far, this research is showing promising results. The soft socket for the below knee amputee gave excellent results on an experimental basis, but it still has to pass the field test. Though this effort is primarily intended to aid veterans or service men, eventually it also benefits the civilian amputee. It is worth noting that there are between 30,000 and 40,000 new amputees each year. These people need care and sound medical advice.

I thoroughly agree with Dr. Thomas that the medical profession as a whole manifests little interest in the problem of amputee care and lacks appreciation of total rehabilitation. Proper fitting and alignment of a prosthesis is still an art possessed by few, but this phase is the most important of the program. Successful management of this phase will greatly influence and determine the final outcome of the total rehabilitation program. It is obvious that a misfitted prosthesis, causing pain on each step, will limit the functional scope of the amputee, yet one sees such cases daily. The answer to this problem, as Dr. Thomas has emphasized, is to improve our teaching methods on the undergraduate and postgraduate levels in medical schools and centers. Such training should be and must be required for all residents in orthopedic surgery and physical medicine.

I would like to suggest that during each annual meeting of this Congress, at least one session be devoted to a symposium on the various problems of prosthetic and orthopedic appliances. These devices are encountered daily by the physiatrist in his practice, and he should be well versed in their use and application.

As a general rule, the physiatrist has a longer contact with the amputee and has the opportunity to see him under diverse situations during the training process. If any complications occur, the physiatrist should be able to correct them as they arise. The great majority of complications are caused by dynamic changes in the stump resulting in altered fit of the prosthesis. Therefore, it is imperative that the physiatrist have a thorough knowledge of fitting and alignment. In this connection, I would like to emphasize that it is not enough to see an amputee walk a few feet with his prosthesis or perform a few simple movements of the arm for evaluation of the fit. Proper evaluation requires a thorough observation, which necessitates repeated analysis of functional ability over a sufficient period of time. Only in this way can successful fitting be insured.

PATHOGENETIC CONCEPTS OF "FIBROSITIS" *

Fibropathic Syndromes

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"Fibrositis" is certainly not only a confused but also a confusing term Therefore it is altogether preferable to use the term "fibropathic syndromes" to indicate the different non-arthritic rheumatic symptom-complexes of different etiology, pathology, pathogenesis, and clinical course.

The purpose of this brief summary of the more thoroughly elaborated pathogenetic concepts of fibropathic syndromes is two-fold: (a) To demonstrate that there is already adequate workable knowledge of the bio-chemical, bio-physical, neuro-physiological, and bio-electrical aspects of the fibropathic syndromes available to show that attempts at solving the problem from a histo-pathological aspect are a priori doomed to failure. (b) To stimulate more research in these lines in order to achieve a scientifically acceptable comprehension of this obscure but important ailment.

I. Neural Reflex Mechanisms

The concept of neural reflex mechanisms in the pathogenesis of fibropathic syndromes originated from two basic observations:

(1) *Any lesion* — visceral or somatic — may cause secondary (reflectory) pain, tenderness, spasm, and also actual lesion at a distant "area of reference."

(2) *This secondary lesion may* — in due time — assume the character and functions of an independent lesion producing symptoms and signs of its own.[1]

Although the distribution of referred spasm, pain, tenderness, and vasoconstriction does not follow recognized segmental patterns, it can definitely be ascertained that many fibropathic syndromes show certain patterns as to localization ("sites of predilection") not only of the primary but also of the secondary (referred) signs and symptoms.

The neural reflex concept is based on two neuro-anatomical and two neuro-physiological observations. The two neuro-anatomical observations are:

(A) Axon branching.

This explains referred pain as originating at a primary lesion but — *by faulty central localization of pain perception* — being projected to and localized at the terminal of another branch of a bifurcated sensory nerve axon. (Sinclair, et al.[1]) Evidence of this mechanism may be seen in the following observations:

(a) Procainization of the zone of reference does not abolish referred pain, while procainization of the primary lesion does.[2]

(b) Injection of saline solution into interspinous ligaments provokes pattern-like referred pain in a phantom limb.[2]

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* Read at the meeting of the Eastern Section of the American Congress of Physical Medicine on April 28, 1951.

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1. Sinclair, D. C.; Weddell, G., and Feindel, W. H.: Referred Pain and Associated Phenomena, Brain 71:184, 1948.
2. Harman, J. B.: The Localization of Deep Pain, Brit. M. J. 1:188, 1948.

(c) "Pain spreads from fingers immersed in cold water to adjacent anesthetized fingers." (Kunkle and Armistead.[3])

In all these instances, pain is being perceived in non-existing, or in anesthetized structures because of central misinterpretation of localization.

Persistent referred pain may eventually result in production of metabolites at the terminal of the secondary branch and cause referred tenderness and also actual referred lesion.[1] Evidence of this hypothesis can be seen in the following observations:

(a) Procainization of the zone of reference abolishes *referred tenderness but not referred pain.*

(b) Procainization of the primary lesion abolishes referred pain, but may fail to abolish referred tenderness if the referred tenderness has already assumed the character and function of an independent lesion with symptoms and signs of its own.

(B) Sensory Reflex Organization of the Cord.

A large number of neurons are said to be interposed between the posterior horn (i. e., sensory pathways) and the motor pathways in the anterior and lateral horns (somatic and sympathetic, respectively). These neurons represent an "internuncial pool" (Lorente de No[4]) which functions as a vast relay station between the incoming and the outgoing pathways of all segments in the cord. It can also sort out incoming sensory impulses and switch them to motor and sympathetic neurons over the entire cord and thus activate reflectory hetero- or multi-segmental responses. The selective function of the internuncial pool can also explain the fact that similar incoming sensory impulses may activate different pathways in different intensities at different times. (Gasser.[5])

"Potentially, activity entering the central nervous system by any given neuron-path is capable of influencing by more or less devious routes every other neuron therein." (Lloyd.[6]).

Through this complicated network, interposed between afferent pathways, incoming sensory impulses may initiate co-ordinated waves over one or more segments, thus stimulating a large number of motor and sympathetic neurons and inhibiting others and bringing about those poorly understood and often-times misinterpreted reflectory — sometimes labelled as "hysterical" — patterns.

Neuro-Physiological Observations

(A) It was demonstrated by electro-myographic studies that myalgic muscles are in a constant hyper-excitatory state even at rest. It is also known that minimal contractions can reflectorily be increased in magnitude by mild superficial sensory stimulation which in itself would be inadequate to provoke motory response in a resting, normal muscle. (Phenomenon of facilitation.)

Such a mechanism of facilitation can be accounted for many acute exacerbations of pre-existing, asymptomatic myalgic lesions provoked by various precipitating factors such as cold, trauma, infection, fatigue. Emotional experience strong enough to upset the normal physiology of the central nervous system may stimulate the same pre-existing, asymptomatic myalgic lesions.[8] ("Facilitation from above." Elliott.[7])

3. Kunkle, E. C., and Armistead, G. C.: Unpublished Observations. (Cit. Wolff, H. G., and Hardy, J. D.: On the Nature of Pain. Physiol. Reviews 27:167, 1947. Quot. by Sinclair, et al.).
4. Lorente de No, R. (Cit. by Kelly, M. Ref. No. 8.).
5. Gasser, H. S.: Control of Excitation in the Nervous System. Bull. N. Y. Acad. Med. 13:324, 1937.
6. Lloyd, D. P. C.: Functional Organization of the Spinal Cord. Physiol. Rev. 24:1, 1944.
7. Elliott, F. A.: Aspects of "Fibrositis." Ann. Rheum. Dis. 4:22, 1944.
8. Kelly, M.: Fibrositis and Reality. Ann. Rheum. Dis. 4:46, 1944; Nature of Fibrositis, Ann. Rheum. Dis. 5:1, 1945; Interstitial Neuritis and the Neural Theory of Fibrositis, Ann. Rheum. Dis. 7:89, 1948.

Protracted reflectory stimulations may not only initiate but also perpetuate over-excitation of internuncial pathways resulting in referred tenderness and in referred lesion at the zone of reference. "Residual effect" of traumas described by Gower may well come into this category.

(B) Stimulation of sensory nerve trunks (not of nerve endings!) is mainly, if not solely, capable of producing *referred* phenomena. Sinclair, et al.[1] are believed to have proved that referred phenomena produced by injection of hyper-tonic saline solution into interspinous ligaments are actually induced by irritation of the neighboring sensory nerve trunks and not by irritation of sensory nerve trunks run farther away from the respective interspinous ligaments of the lumbar spine did not produce referred pain because the lumbar sensory nerve trunks run farther away from the respective interspinous ligaments than the thoracal sensory nerve trunks.

These observations may explain why certain fibropathic lesions cause complex referred phenomena while others cause only local symptoms and/or signs, or remain silent altogether.

The same observations may also contribute to the understanding and management of arthalgia, the so frequently encountered subjective complaint of pain in joints which do not show any objective signs of disease.

Arthralgia may represent pain in a non-arthritic joint which became the area of reference to some extra-articular primary lesion. Hilton's law states that the same nerves which supply the muscles moving a joint furnish the sensory innervation of that joint. In fact, procainization of a "trigger area" frequently brings complete relief from pain in a neighboring joint.

Whether the concept of a separate system of deep pain sensation, segmentally not corresponding with epicritic sensations, aids to better comprehension of and to a more successful approach to the fibropathic syndromes remains to be seen.

II. Fibropathic Syndromes as Psychogenic Rheumatism

The concept that fibropathic syndromes represent a form of psychogenic rheumatism deserves more than a passing thought. Psychogenic "fibrositis" has been considered a somatic expression of such psychic states as tension, conversion hysteria, suppressed hostility, aggression, symbolization of frustration, submission.

Some authors have stated that almost all cases, if not every case of "fibrositis" is psychogenic; that clinical findings have no significance; and that *physical therapy may be harmful* because it may concentrate the patient's attention on his somatic symptoms.

The highlights to be considered with regard to these concepts — in order to avoid unsound application of sound psycho-somatic principles — are the following:

(1) Co-incidence of somatic symptoms and of emotional disturbances is no proof of the "psychogenic" origin of the somatic symptoms even in the absence of demonstrable organic pathology. Absence of pathological findings has been considered as evidence of pure psychogenic rheumatism, while presence of inadequate pathological findings was considered compatible with "super-imposed psychogenic" or "psychosomatic" rheumatism.

(2) Any fibropathic syndrome manifesting itself after emotional experiences has not necessarily been caused by them. "Post hoc" is not necessarily "propter hoc."

(3) Any subclinical, asymptomatic lesion can be rendered symptomatic by additional precipitating factors. As precipitating or aggravating factors,

however, not only inanimate environmental influences, may function (e. g., adverse climatic conditions, infection, traumas, toxins, etc.), but also psychic disturbances upsetting normal physiology of the central nervous system — without anticipating symbolistic, or hysterical mechanisms in their origin.[8] (See: "Facilitation from above" under "A.")

(4) There is sufficient evidence of the involvement of the endocrine and nervous systems in rheumatic disorders on one hand and of the influence of the endocrine and central nervous system on the personality on the other to assume that certain somatic and psychic symptoms in rheumatic patients may be concurrently caused by the same rheumatogenic agent. Frequently, it is difficult to differentiate between "psychogenic rheumatism" and "rheumatogenic psyche."

(5) Normal adjustmental mechanisms of rheumatic subjects frequently fail because of their being overburdened by the additional stress caused by the rheumatic process itself. (Pain, rejection, physical impairment, inadequacy, economic and social deprivation, deflated self-respect and inflated inferiority feeling, etc.) Symptom-consciousness, symptom-utilization, and symptom-exaggeration in all rheumatic subjects are more common than symptom-imagination. (Neufeld.[9])

(6) Psychodynamically speaking, sometimes "psychogenic rheumatism" may represent a "psychogenic" diagnosis to compensate for an unconscious feeling of inadequacy on the part of the diagnosing authority for not being able to demonstrate adequate objective pathological processes accountable for the symptoms, and to gratify our causalistic medical philosophy. ("The development of a special sense is often followed by atrophy of the common sense," said W. A. Lane.) (Gray.[10])

III. Increased Interstitial Hydrostatic Pressure

The concept of increased interstitial hydrostatic pressure in fibropathic syndromes presupposes that fluid accumulation within the inelastic fibrous tissues results in pain caused by mechanical distension, pressure and stretching.

This concept is significant for several reasons:

(1) Fatty tissue, a frequent site of fibropathic syndromes, is known to function also as storage of water:

(2) Electrolyte imbalance and variations in osmotic pressure which necessarily accompany the changing ion-concentration in the fluctuating interstitial fluid may result not only in mechanical but also in bio-chemical and/or bio-electrical stimulation of the sensory nerves of the affected connective tissues and be responsible for the notorious effects on rheumatic subjects of atmospheric changes. This patho-physiological phenomenon probably is the most frequent patho-genetic factor to be accounted for what one might call fibropathic diathesis in such a great number of persons.

(3) The well-known endocrinogen disturbances of certain fatty tissues, sometimes termed panniculitis, fat hyperplasia, and also related to adiposis dolorosa, may frequently be alleviated by systemic dehydration, and/or proper endocrine therapy. (Copeman.[11]) Decrease of local tension by injections, "needling," or deep massage, frequently improves or cures localized fibropathic syndromes. It is reasonable to assume that disturbances in the deli-

9. Neufeld, I.: Outline of Teleo-psychological Principles in Rehabilitation of the Physically Handicapped, Bull. Ind. Psychol. 4:47, 1951.
10. Gray, C.: The Causes and Treatment of Sciatic Pain, Int. Abstr. Surg. 85:417 (Nov.) 1947.
11. Copeman, W. S. C.: Fibro-fatty Tissue and Its Relation to Certain Rheumatic Syndromes, Ann. Roy. Coll. Surg. 3:110, 1949; and Pugh, G. C. E.: Effects of Artificial Dehydration in Rheumatism, Lancet 2:384, 1945.

cate electrolyte-fluid homeostasis is mainly responsible for the notorious "tetralogy of fibropathic syndromes," namely pain, tenderness, post-inertial dyskinesia ("stiffness," or "jelling"), and easy muscular fatiguability.

IV. Traumatogenic and Post-Traumatic Fibropathic Syndromes

The role of trauma and mechanical maladjustment of the soft somatic tissues in the pathogenesis of fibropathic syndromes has unjustly been underestimated. On careful investigation, in many cases of localized fibropathic syndromes, traumatic and/or mechanical elements can be elicited as etiological as well as precipitating factors.

Acute traumas (e. g., acute herniations of fat lobules, sprains, and strains) cannot strictly be included among the fibropathic syndromes. Many chronic and recurrent, apparently "idiopathic" fibropathic syndromes, however, — although no major accident can be elicited in the patient's past history — belong to the group of the post-traumatic fibropathic syndromes. (Cf. "Residual effects of trauma" of Gower.)

Fibropathic reactions to trauma and to mechanical maladjustment may occur in many ways:

(1) *Prolonged immobilization* interferes with normal circulation of blood and lymph, with normal metabolism, and also with normal nerve conduction. Insufficient circulation in connective tissues, which are known to have a poor blood-vessel supply even under normal conditions, interferes with adequate absorption of extravasates, exudates, and tissue-debris and thus enhances biochemical fibropathic reactions.

(2) *Inadequate or unduly short immobilization* cause repeated irritation of the healing tissues, new extravasates, exudates, and prolonged swellings the organization of which is apt to result in fibropathic reaction because their duration was prolonged beyond possibility of complete absorption. Furthermore, repeated and increased pain sensations invoke the previously described reflex mechanisms of referred pain, tenderness and lesion, vasomotor disturbances, sympathetic dystrophies, etc., etc. (Cf. "Neural Reflex Mechanisms" under I.)

(3) *Injury to a sensory nerve* or to the tissues in its neighborhood is prone to develop into post-traumatic reflectory fibropathic syndromes and/or sympathetic reflex dystrophies despite proper treatment. (Cf. I.2.B.) In fact, fibropathic syndromes have often been considered a sort of "minor causalgia."

(4) *Soft tissue injuries*, frequently overlooked, unattended and even forgotten of, may leave predisposition to "fibropathic" episodes.

"Sprains" deserve special attention in this respect. Patho-mechanically sprains are momentary subluxations which because of the insufficiency of the attacking force, did not proceed to complete dislocation but were spontaneously and immediately reduced by themselves. According to the degree of the actually occurred momentary subluxation the joint capsule, the ligaments, and the peri-articular soft tissues were unduly stretched and/or partially torn with all the above discussed consequences.

(5) *Injury to asymptomatic osteo-arthritic joints* may bring about irritation of the joint by separation of minute osteo-phytic excrescences, and/or by overstretching the relatively inelastic capsule. Consequently, reflectory muscle spasm, referred pain, tenderness and actual lesions in the muscles moving or fixing that joint may follow. (See "Hilton's law" above.)

Thus an asymptomatic osteo-arthritis (or possibly even pure "osteophytosis" of Collins[12]) may be made symptomatic by trauma.[13]

(6) *Repeated micro-traumas, occupational and postural strains* play a similar role in the pathogenesis of fibropathic syndromes. Their significance, in a given case, however, seems to be more difficult to evaluate, especially from a legal point of view.

V. Faulty Metabolism in the Pathogenesis of Fibropathic Syndromes

(A) The significance of the electrolyte-fluid metabolism have briefly been outlined above. (III.)

(B) Creatine metabolism and deficiency in Vitamin E have been brought in connection with certain forms of fibropathic syndromes but denied by others.

Present knowledge of the possible pathogenic (experimental, clinical, and speculative) relationship between creatine metabolism, tocopherol administration, and fibropathic syndromes may be summarized thus:

1. The extent of "normal" creatinuria has not yet been determined. Creatinuria (up to 196 mg. per 24 hours) is being considered normal in females, especially during menstruation and pregnancy. In males, normally there is no creatinuria at all, or up to 100 mg. per day, in children up to 15 mg. per day.
2. Bedrest and immobilization of a limb in plaster cause increased excretion of creatine in the urine. Bedrest alone with or without vigorous massage but without rigid immobilization did not increase creatinuria. (Deitrick, et al.[14])
3. In systematic study on 38 "fibrositic" ambulatory patients, only 8 patients showed slightly increased creatinuria. (Sylvest and Hvid-Hansen.[15])
4. Creatinuria was reported to vary with the clinical course of fibrositis. (Brochner-Mortensen and Glemmesen,[16] and Wilson.[17])
5. "Blood tocopherol in fibrositic patients was 35 per cent lower than the average normal. After vitamin E medication the blood tocopherol level rose to an average of 58.5 per cent of the normal." (Ant.[18])
6. Administration of tocopherols seem to improve the clinical course of primary fibropathic syndromes. (Ant, Steinberg,[19] Wilson.)

(C) Blood Cholesterol determination in a number of patients suffering from fibropathic syndromes frequently revealed increased blood cholesterol levels. Although present material cannot yet be considered as conclusive, one fact seems to be significant: The increased blood cholesterol level was not always in direct proportion to the decreased basal metabolism rate. Final reports of this aspect will be reported at a later date. At any rate, thorough observation of certain aspects of cholesterol metabolism in fibropathic and rheumatic disorders may prove to be a worthwhile and fruitful undertaking.

The role of ten other factors in the pathogenesis of fibropathic syndromes cannot be elaborated upon in this condensed exposition.

On closer analysis, the different pathogenetic concepts by no means contradict each other (although frequently they might seem to do so). Some of them complement each other, in that in certain cases of clinical fibropathic syndromes one or the other mechanism seems to prevail, while in other cases two or more pathogenetic mechanisms may concurrently or consequently occur.

12. Collins, D. H.: Pathology of Articular and Spinal Diseases, The Williams & Wilkins Co., Baltimore, 1950.
13. Hanlon, G. R., and Estes, W. L., Jr.: Osteo-arthritis Aggravated by Trauma, Am. J. Surg. **78**:556, 1949.
14. Deitrick, J. E.; Whedon, G. D., and Schorr, E.: Effects of Immobilization Upon Various Metabolic and Physiologic Functions of Normal Men, Am. J. Med. **4**:3, 1948.
15. Sylvest, O., and Hvid-Hansen, N.: Investigation of the Creatine Excretion in the Urine, Ann. Rheum. Dis. **9**:241, 1950.
16. Brochner-Mortensen, K., and Clemmesen, S.: Creatinuria in Patients with Palpable Muscle Affection (Myositis), Acta Med. Scand. **106**:540, 1941.
17. Wilson, M. J.: Personal Communication.
18. Ant, M., and Mamelock, A. E.: Vitamin E in the Treatment of Fibrositis with Complicating Osteoarthritis, Med. Times **76**:162, 1948.
19. Steinberg, C. L.: Tocopherols in Treatment of Primary Fibrositis, J. Bone & Joint Surg. **24**:411, 1942.

In conclusion, it should be remembered that when our clinical experiences with fibropathic syndromes do not concur with our theoretical concepts, one should recall Michael Kelly's warning: "If our theories do not accord with observed facts, it were wiser to modify our theories rather than explain away the facts."

Summary

Essentially, this presentation is a summary of certain pathogenic concepts (mainly the neuro-anatomical, neuro-physiological, psycho-somatic, physico-chemical, traumatological, and metabolic aspects) of "fibrositis" and their objective evaluation in the light of available clinical and experimental research. The term "fibropathic syndromes" is considered to be more appropriate as a collective term for all the clinical conditions for which "fibrositis" has uncritically been used. The four chief symptoms ("tetralogy of fibropathic syndromes"), namely: pain, tenderness, post-inertial dyskinesia (usually but improperly called "jelling" or "stiffness"), and easy muscular fatiguability, may more satisfactorily be approached if one is familiar with the main principles of the patho-mechanism of these mainly functional syndromes. Certain peculiar features, such as non-arthritic joint pain (arthralgia), non-segmental reflectory phenomena (often labelled as "hysterical"), weather-sensitivity, responses to physical and other therapeutic procedures, psychogenic rheumatism, psychogenic diagnosis, rheumatogenic psyche, stress-conditioned rheumatic symptoms, post-traumatic and traumatogenic fibropathic conditions are briefly discussed on the basis of presently available scientific data.

A strong plea for further research along the mentioned lines, and against rejection of patient's justified but not fully understood complaints, and against unsound application of sound psychosomatic principles have been stressed.

MEDICAL NEWS

Members are invited to send to this office items of news of general interest, for example, those relating to society activities, new hospitals, education, etc. Programs should be received at least three weeks before the date of meeting.

Correction

In the April, 1952, issue of the ARCHIVES, announcement was made concerning the Congress members who had attended the Latin-American Congress of Physical Medicine, Panama City, February 25.

The name of Dr. **John C. Hubbard** was inadvertently omitted. Dr. Hubbard presented a paper entitled "Reviewing the Galvanic Current."

Our apologies to Dr. Hubbard.

Symposium on Poliomyelitis

A symposium on Poliomyelitis was presented at the Miami Valley Hospital, Dayton, Ohio, May 27-28, 1952, under the direction of Herman J. Bearzy, Head, Department of Physical Medicine and Rehabilitation.

The morning session consisted of the following topics: "Etiology and Epidemiology of Poliomyelitis," by Melvin Oosting, M.D.; "The Neurologic and Pathologic Physiology of Poliomyelitis," by N. R. Hollister, M.D.; "The Clinical Aspects and Treatment of Acute Poliomyelitis and Bulbar Poliomyelitis," by Mason Jones and W. B. Taggar; "The Role of the Otolaryngologist in Bulbar Poliomyelitis," by J. T. Bickmore; "Physical Medicine in the Treatment of Poliomyelitis," by Herman J. Bearzy, and "The Role of the Orthopaedic Surgeon in the Treatment of Poliomyelitis," by H. F. Hilty.

The afternoon session was devoted to clinical demonstrations on "Nursing Care in Poliomyelitis"; "Use of the Respirator"; "Muscle Testing and Muscle Reeducation Exercises"; "Occupational Therapy Activities"; "Splinting and Bracing Procedures," and finally, open discussion.

Brochure for Handicapped Workers

The Easter Seal Society has prepared a brochure on "Careers in Service to the Handicapped" to help young people secure information about positions for the handicapped in the field of rehabilitation. The National Society for Crippled Children and Adults will distribute gratis more than 23,000 copies to public and parochial school systems. Copies will also be donated to every college and university throughout the United States. For those not able to obtain copies gratis, the charge will be 50 cents. These may be secured by writing either to the National Society for Crippled Children and Adults or the National Foundation for Infantile Paralysis.

Pennsylvania Academy of Physical Medicine and Rehabilitation

At the April meeting of the Pennsylvania Academy of Physical Medicine and Rehabilitation, Dr. Temple Fay presented an illustrated lecture on "Status of Rehabilitation in Denmark and the Scandinavian Countries," accompanied by colored motion pictures.

At the May meeting, Dr. J. F. Rubacky presented the topic "Evaluation of Orthopedic Disabilities Due to Trauma," followed by a question and answer period. Officers for the ensuing year were elected at the business meeting.

Conference on Exceptional Children

The Woods Schools, Langhorne, Pa., sponsored a conference on "Helping Parents and Teachers Understand Exceptional Children" on May 20. The purpose of the all-day meeting was "to contribute to greater understanding of the child, who, because of a physical handicap, a mental defect or emotional problem, does not respond to the regimen of regular school work." The solution to the problem must be met by special classes in public schools, by special schools themselves, and by increased understanding at home.

The following topics were presented: "The Psychology of the Exceptional Child"; "Emotional Quandaries of Exceptional Children"; "The Child from the Editor's Chair"; "Growth of Social Responsibility for the Exceptional Child" and "How to Build Understanding of the Exceptional Child."

Any inquiries concerning the conference should be directed to Dr. A. Ralph Carli, The Woods Schools, Langhorne, Pa.

Schedule for Graduate Courses, 1952-53

The schedule for short-term graduate courses for physicians, physical therapists, occupational therapists, nurses and counsellors given at the Institute for Physical Medicine and Rehabilitation, New York, N. Y., has been announced. It follows:

Physicians — July 14-25; Sept. 22-Oct. 17, 1952.

Physical Therapists — Oct. 27-Nov. 21, 1952; Jan. 5-30, 1953.

Occupational Therapists — Oct. 6-24, 1952; Mar. 3-Apr. 10, 1953.

(*Medical News Continued on Page 372*)

ARCHIVES of PHYSICAL MEDICINE

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL MEDICINE

.·. EDITORIAL .·.

ANNUAL SESSION — AUGUST 25-29, 1952

The thirtieth annual session of the American Congress of Physical Medicine will be held in New York City, August 25-29, 1952, at the Hotel Roosevelt. The selection of the last week in August for this year's meeting will please many members who in the past have found the Labor Day week, which has been the one usually chosen, had conflicted with many other plans and activities. The choice of New York City is also a wise one since it will permit the greatest number of physiatrists and persons interested in Physical Medicine to attend.

The Scientific sessions will be confined to one session in the morning and one session in the afternoon. The number of papers submitted far exceeded the time permitted for the reading of all the papers, necessitating the listing of a number of papers to be read by title only. All the papers for this meeting, both those to be read at the sessions and those to be read by title only, are exceptional — many contain the latest information on the clinical application of physical measures; many bring out the latest developments and utilization of the various facets of rehabilitation, and many describe the newest clinical and basic research investigations that have been carried out during the past year. Practically every subject in the field of Physical Medicine and Rehabilitation will be presented.

The Scientific exhibits this year should arouse unusual interest. The number of applications was the largest for any meeting. The exhibits prepared by the many clinics and hospitals will show much original material; also the practical use of many features of Physical Medicine and Rehabilitation. The opportunity of studying these exhibits and asking questions or discussing definite problems with the exhibitors, is actually a post-graduate course in itself.

The Seminar arranged by the Committee on Education of the American Congress of Physical Medicine will consist of sixteen instruction courses. As in the past, the lectures will be divided into two groups — the one pertaining to basic and research problems should interest physiatrists particularly; the other group includes the various clinical subjects which should appeal to all physicians and other personnel in Physical Medicine and Rehabilitation. The committee has again secured outstanding authorities for these lectures whose selection is based not only on their knowledge of the subject but also on their ability to present a complete and clear review of the material. The Seminar courses have always been well attended so that an early application is suggested.

In the Technical exhibits, the latest apparatus, supplies and other material will be demonstrated. This section affords the visitors a chance to see and evaluate the various types of equipment used today in the departments of Physical Medicine and private offices and to ask the exhibitors specific questions as to their operation and function. Every worthwhile manufacturer and distributor of physical medicine material will be present.

The banquet this year will be addressed by a man internationally famous

in many walks of life. His support and interest in Physical Medicine has done much to aid this specialty. His speeches are known for their sagacity and stimulation, and are long remembered. Other new features for this evening will make it a gala event.

Many visitors find that a certain amount of play aids work. Certainly New York City offers a greater variety and volume for "relaxation" than most cities. The attractions at the theaters, sports events, museums, and musical recitals of varied types, are sufficient for all tastes. The famous dining places are in themselves a real diversion.

This thirtieth annual meeting should be one of the best. The greater the interest and enthusiasm by the greatest number, makes for the best organization.

Medical News

(*Continued from Page 370*)

Personals

Dr. **John H. Aldes,** Los Angeles, will present a paper entitled "The Use of Ultrasonic Therapy in the Treatment of Hypertrophic Arthritis With and Without Radiculitis — Geriatric Group" at the International Congress of Physical Medicine, London, July 14-19. Dr. Aldes is also attending the American and British Orthopedic Association meeting in London and will make a tour of the rehabilitation centers in the Scandinavian countries before returning to the U. S.

Dr. **Louis B. Newman** addressed the Regional Chapter of the American Acadamy of General Practice in Chicago on May 22, 1952. Dr. Newman's illustration lecture was on "The Scope of Physical Medicine and Rehabilitation."

Dr. **Edward E. Gordon** has been named Director of Medical Services at the Institute for the Crippled and Disabled, New York, N. Y. He has also been named Associate Professor of Rehabilitation Medicine at the College of Physicians and Surgeons, Columbia University.

Dr. **Waldemar Bianchi,** has been appointed professor of physical medicine, Faculdade de Ciencias Medicas, University of Federal District, Rio de Janeiro, Brazil.

Dr. **S. Malvern Dorinson** of San Francisco, California, recently presented the topic "Physical Medicine in General Practice" at the San Francisco Medical Society.

Conference on Aging

Housing the Aging is the topic for the University of Michigan Fifth Annual Conference on Aging to be held in Ann Arbor, Michigan, July 24-26, 1952.

The three-day conference will consider the housing needs of healthy, chronically ill, confused and disabled older people living in urban and rural areas. Among the topics to be discussed are types of housing and living arrangements; architectural designs and costs; hygiene and safety standards; social and economic aspects of housing; and auxiliary services. The conference is designed to serve as a forum for interchanging information and for getting action on the difficult problem of financing housing for the aging.

The conference is under the co-sponsorship of the Institute for Human Adjustment, Schools of Architecture, Business Administration, Social Work, Public Health, and the Medical School, Extension Service and Summer Session of the University of Michigan; the Michigan State Medical Society; the Committee on Aging and Geriatrics of the Federal Security Agency, Washington, D. C., and the Housing and Home Finance Agency, Washington, D. C.

Conference registration materials may be obtained by writing to Dr. Wilma Donahue, Institute for Human Adjustment, Room 1510 Rackham Building, Ann Arbor, Michigan.

BOOK REVIEWS

The reviews here published have been prepared by competent authorities and do not represent the opinions of the American Congress of Physical Medicine.

A DOCTOR'S PILGRIMAGE. By *Edmund A. Brasset*, M.D. Cloth. Price, $3.50. Pp 256. J. B. Lippincott Company, 227-231 S. Sixth St., Philadelphia 5, 1951.

The protagonist of this story tells of his experiences from the time he finishes his internship in the hospital at Halifax to the day, years later, when he finally decides to make no further efforts to become a brain surgeon. During this interval he practices in several towns in Nova Scotia, serves as assistant physician in a mental hospital, takes postgraduate courses, and begins a residency in neurosurgery. In each situation there recur the conflicts resulting from a distressing innocence in money matters, the false attitudes that pass for scientific among some medical school faculties, the generous impulse to devote every ounce of his strength to the unending succession of patients who need him, and the need of a normal man for wife, home, and family.

There is not a dull or affected page in this book; it is utterly sincere and has the fascination of genuine though restrained realism. One closes it with the feeling that every medical student, and many physicians, ought to read it.

VITAMINS AND HORMONES. Advances in Research and Applications. Edited by *Robert S. Harris*, Professor Biochemistry of Nutrition, Massachusetts Institute of Technology, Cambridge, Mass., and *Kenneth V. Thimann*, Professor of Plant Physiology, Harvard University, Cambridge, Mass. Vol. IX. Cloth. Price, $8.00. Pp. 395, with illustrations. Academic Press, Inc., 125 East 23rd Street, New York 10, 1951.

The reviews on vitamins in this volume reflect the view, now increasingly accepted, that vitamins act basically as coenzymes. Thus, the functions of vitamin B_{12} and of folic acid are considered in terms of purine and pyrimidine biosynthesis and metabolism and of the participation of "labile methyl groups" and formate; the antimetabolites of nucleic acid metabolism and the enzymatic reactions of biotin are extensively considered.

The sections on steroids deal with the interrelations of vitamin deficiencies and the adrenal cortex, the enzymatic associations of estrogens, the synthesis of radioactively labeled steroids of clinical interest and an authoritative discussion of the activities of cortisone and ACTH.

Each of the contributors is an expert in his special field; their papers are well organized, appropriately critical and admirably concerned with causes and mechanisms. It is unavoidably unfortunate the pace of modern science renders such a book out of date even before it is published. The clinician interested in the fundamental aspects of pernicious anemia, cobalt deficiency and the collagen diseases will gain much from perusal of relevant chapters.

THE BATTLE FOR MENTAL HEALTH. By *James Clark Moloney*, M.D. Cloth. Price, $3.50. Pp. 105. Philosophical Library, Inc., 15 East 40th St., New York 16, 1952.

The author is a member of a group that founded the Cornelian Corner in Detroit in 1942. Their objective might be summarized in that they are strong supporters of T. L. C. (Tender Loving Care) of mother-child relationship. They advocate natural childbirth, "rooming" procedures in maternity hospitals, breast feeding, permissive child rearing, etc. This short book sets forth the author's concept of mental health and illness in this and other civilizations and a few suggestions for its improvement. Most of the ideas are interesting and stimulating; however, his explanation of the conflict in a child who is bottle fed leaves this reviewer a bit unimpressed. The statement is made that the "head end of the baby, where he was hungry, he had no warm, interpersonal relationship with his mother. At the other end, however, where he defecated and urinated at will into a diaper, the baby did have opportunity for a warm relationship with his mother" — because "the anal end was more considerately treated."

STANDARD NOMENCLATURE OF DISEASES AND OPERATIONS. Fourth Edition. By *Richard J. Plunkett*, M.D., Editor, and *Adaline C. Hayden*, R.R.L., Associate Editor. Published for the American Medical Association. Cloth. Price, $8.00. Pp. 1034, with four illustrations. The Blakiston Company, 1012 Walnut St., Philadelphia 5, 1952.

This new edition has been completely revised and brought up to date since the last edition in 1942. "Code numbers for acute and chronic conditions are made consistent, new heart diagnoses are included, diseases of hemic and lymphatic systems are revised to conform to accepted terminology, the dental and tuberculosis sections are enlarged, and the section on operations includes new operative procedures used in skin grafts and cardiac surgery. Also, the supplementary terms are

placed in one section and the disease and operations indexes are placed consecutively in the book. In addition to these revisions, an International Statistical Classification of Diseases, Injuries and Causes of Death is included. These code numbers are cross referenced to the 'Standard' code numbers."

PSYCHOLOGICAL DYNAMICS OF HEALTH EDUCATION. Proceedings of Eastern States Health Education Conference, April 13-14, 1950. (Under auspices of New York Academy of Medicine.) Cloth. Price, $2.50. Pp. 134. Columbia University Press, 2960 Broadway, New York 27; Oxford University Press, Amen House, Warwick Sq., London, E. C. 4, 1951.

As Simmons remarks on page 56 of this excellent book, the knowledge and control of man, not matter, is our present most urgent scientific problem. This book consists of thirteen sections by various authors, and their consistently temperate, penetrating manner inspires the hope that this problem may some day be solved. They are all concerned with one aspect of this problem, namely, the motives to which one can appeal when going to the public with any given program of health education.

Several chapters discuss the peculiar psychological dynamics of special groups such as the adolescents; others take up group tensions, such as those involving minority groups. There is a chapter on the dynamics of mass media, publicity and advertising, and several chapters take up the motivations that can be used in particular problems such as venereal disease education. One question, for instance, is the extent to which the educator can appeal to fear by "scaring the public"; another is how to overcome the strong feeling of personal immunity in some people. It appears that psychologists have receded somewhat from the uncompromising ideal of "accentuating the positive and eliminating the negative." On page 129 there is a guarded hint that people may need to be "prepared to be ill," and on page 105 is the reluctant admission that all of us face eventual death and must respect the fact. These things, too, must be remembered in connection with health education.

This book can be read with profit by practicing physicians, by medical students, by those teaching in medical schools or teaching physiology and hygiene in any other kind of school, by every one active in rehabilitation, and by those concerned with the public relations of medical institutions such as hospitals.

SOCIAL MEDICINE IN WESTERN EUROPE: REPORT OF A WORLD HEALTH ORGANIZATION TRAVELING FELLOWSHIP, SUMMER, 1950. By *E. Richard Weinerman*, M.D., M.P.H., Medical Director, Permanente Health Plan, Oakland, California. Visiting Associate Professor of Medical Economics, School of Public Health, University of California, Berkeley. Paper. Price, $2.00. Pp. 82. School of Public Health, University of California, Berkeley, 1951.

This report covers a three months survey of social medical programs in England, Scotland, Belgium, Holland, Denmark, Sweden, Switzerland and France.

The term "Social Medicine" is defined as "an extension of the older confines of public health into the broadest consideration of social, emotional and administrative aspects of health." The report is divided into three sections — 1, Teaching and Research; 2, Public Health Organization and 3, Medical Care Organization. Most of the information is factual, however on occasion the author's impressions may have been influenced by his personal opinion. He has considerable respect for the conditions he found in Great Britain. He summarizes the medical care there as follows — "the National Health Service was found to be a tremendous step forward in the financing of a comprehensive program for an entire nation. Its base of tax support rather than insurance premiums gives it a stability and completeness of coverage unequaled in Western Europe." And the implication of the following quotation might appear to be biased by some — "Where economic conditions are favorable, and where governmental policy is progressive, health conditions and controls are seen to be more satisfactory. Where the economic situation is difficult and where conservatives are in control of national policy, there are decidedly poorer health conditions."

In the author's visit to the Copenhagen Mother's Welfare Center, among the things he observed was the "rehabilitation of prostitutes." This should be novel but to this reviewer it would seem that the word rehabilitation is being prostituted.

PHYSICAL MEDICINE ABSTRACTS

Evaluation and Physical Medicine Treatment of Arteriosclerotic Peripheral Vascular Disease. Bror S. Troedsson.

J. Nat. M. A. **43**:31 (Jan.) 1951.

Arteriosclerosis is the number one disease of the present age and will become more so as the percentage of aged people increases. The disease may affect the arteries in all or in localized parts of the body. The heart, the kidneys, the brain and the lower extremities are the structures most frequently giving symptoms. The treatment of peripheral arteriosclerotic vascular disease must have as its object a permanent increase of circulation to the extremity. To achieve this the problem must be attacked from two angles. The primary object is to try to increase the carrying capacity of the affected deeper vessels. The second object is to try to develop the carrying capacity of the collateral vessels, the arterioles and the capillaries. In physical medicine we have a number of agents that can be applied for these specific purposes and to specific areas without causing any undesirable side actions. Although there are hundreds of measures available, mention will be made only of the ones the author uses most extensively. If access to only one measure was possible, Troedsson would pick massage as the most important. Massage dilates capillaries and empties veins and thus permits secondarily easier inflow of arterial blood. In trained and skilful hands massage can be directed to the affected arteries and used to stretch fibrous tissue in the vessels and possibly also break up early calcifications. Some of the effects of massage are better obtained by the use of mechanical apparatus. The Sanders' oscillating bed has a see-saw motion and in its upward tilt empties the venous bed of the lower extremities. In the downward tilt it promotes the influx of arterial blood. This bed has the advantage of being able to do it continuously for unlimited time. In the use of the Sanders' bed, as well as the Buerger's exercises, we use the venous filling time to determine the time for dependency of the extremities and blanching time for period of elevation. Besides the Sanders' bed, the author has found the suction pressure boot, as developed by Herrman, of great value if properly understood and used. This apparatus, called the Pavaex, is used for its pumping action and the exercising action upon the capillary bed, an important phase of the treatment. Troedsson does not believe and has not found any clinical evidence that it affects the deeper arteries to any extent, though it may. The Pavaex apparatus must be used with great attention to detail and must be adjusted for each individual each time a treatment is given, so that a distinct flushing and blanching is produced with each cycle. This involves putting the extremities at the proper height, adjusting the pressures and the cycle, and adjusting the cuff pressure to where it barely prevents escape of air during the positive pressure phase. Unless this attention to details is carried out the results expected cannot be obtained and even harm may be done. It is the author's conviction that the Pavaex should be used only in the hands of people who are willing and capable of giving it the detailed attention it needs. It is not an apparatus to be mechanically applied, as has often been the case and which has detracted from its usefulness. Practically every application of the Pavaex apparatus should be followed by "vascular massage" to the deeper vessels. The same applies to the whirlpool. This apparatus with its whirling, aerated, temperature adjusted water is very useful to create a hyperemia and to give a gentle massage at the same time. However, again it must be used only after a thorough evaluation of the circulatory capacity and generally only in the milder cases, followed by massage. Physical medicine has many valuable agents, that can be specifically applied to specific areas in the treatment of arteriosclerotic peripheral vascular disease. Properly applied they are of more value than any medicinal agents in the treatment of uncomplicated peripheral arteriosclerotic vascular disease.

Intractable Pain in the Neck and Upper Extremities with Particular Reference to Protrusion of Cervical Disks. J. Grafton Love.

North Carolina M. J. **12**:274 (July) 1951.

Pain in the neck and upper extremities is a common complaint. Before satisfactory treatment can be carried out, the attending physician must determine the etiologic factor and the pathologic process. It is not uncommon for a person to have soreness in the neck following exposure to drafts. This condition probably is the result of a myositis, and usually will respond to the exhibition of salicylates and local heat with or without gentle massage. The conservative treatment of the scalenus anticus syndrome, whether cervical ribs are present or not, is physical therapy in the form of local heat and massage, and exercises to strengthen the muscles about the shoulder girdle and so prevent sagging of the upper part of the chest. The scalene syndrome is more commonly seen in women than in men, and those women with large pendulous breasts should be instructed to use an adequate support. Brachial neuritis is a diagnosis that formerly was rather commonly made in cases of pain involving the upper extremity or the shoulder girdle. Brachial neuralgia

is associated with pain in the distribution of one or more nerves of the brachial plexus. If the etiologic factor cannot be determined when the patient presents this complaint, such conservative measures as resting the extremity, avoiding motions which aggravate the pain, the administration of salicylates, and the use of local heat and possibly gentle massage, should be outlined. The patient should be kept under observation and examined periodically for abnormal changes such as the loss of a tendon reflex, the loss or diminution of sensation, or the weakening of any muscle or group of muscles. The conservative treatment of protruded intervertebral disk or of symptoms and signs of involvement of one or more nerve roots in the cervical region consists of the application of cervical traction. This may be done in many ways. Traction may be administered by means of a halter, under the direction of a physician or physical therapist. A homemade halter may be provided and the patient instructed in using it in his own bed. Traction can be applied at night when the patient retires, and he can sleep in the apparatus; or, if the pain is severe, it may be necessary to apply continuous traction day and night. Some patients benefit from the application of heat to the muscles of the neck, particularly those posteriorly, and some feel better after gentle massage of these muscles. Four case reports of protrusion of a cervical intervertebral disk are given in order to indicate the symptoms, signs, methods of investigation, and a type of treatment which has brought about excellent results.

The Place of Occupational Therapy in Physical Medicine. Phyllis Lyttleton.

Brit. J. Phys. Med. **14**:107 (May) 1951.

This is not a discussion of the contributions of all the members of the physical medicine team, but rather a consideration of occupational therapy with as fair an appraisal of its "cans" and "can'ts" as has been found during some years of practice in the physical field, both as physical therapist and occupational therapist. Briefly, occupational therapy assists that part of the healing process which enables a patient to coordinate and correlate all his returning powers towards the normal. For occupational therapy to be of value it must be started early. It must begin when the patient is first able to put forth constructive effort, so that this effort may be directed immediately into the normal channel of creative work, thus preventing the formation of that barrier between physical recovery and total coordination which occurs when recovery is not immediately harnessed to function. With regard to the more usual interpretation of coordination, that on the purely physical plane, occupational therapy provides the ideal treatment, for coordination can only be achieved by use, and the normal activity of the part is obviously its best use. One advantage of occupational therapy over gymnastics lies in the time factor. Fatigue will limit the practice period in either department, but in occupational therapy the interest and concentration required usually postpone the onset of fatigue most markedly. For endurance there is little doubt that occupational therapy is of value. However, endurance of itself has no virtue; it is the capacity to do a certain job continuously without tiring that is the goal, and only by doing the job, or one very like it, can the patient's endurance be so developed that he may return to work having regained his confidence in his ability to do his job.

Recent Developments in Pool Therapy. H. L. Milles.

Brit. J. Phys. Med. **14**:249 (Nov.) 1951.

The main purpose of this article is to evaluate one of the most useful qualities of brine, namely, its buoyance. The methods of using this unique property to the best advantage are discussed, though its possibilities are still being explored. It is evident that many advantages arise from the buoyancy of the brine; for instance, the severely crippled or paralyzed patient is fully supported and can be moved into position with ease, thus saving much time and work for both the physical therapist and patient. Furthermore, the complete support of the body, resulting in relaxation, facilitates instruction in both assistance and resistance exercises, and widens the scope of muscle reeducation. All these various possibilities are still being developed, and recently a bay has been built in the Brine Swimming Pool where the physical therapist can handle the patients without entering the brine, and has full control of their movements while instructing them in suitable exercises. When his progress is satisfactory, the patient can continue in the general swimming pool. Bedridden patients can make their preliminary attempts at walking by the support of the brine, if necessary between parallel bars, their progress being so arranged and graded that they can very gradually support more of the body-weight as they move into shallower brine. For shoulder-joint movements the patient is fixed to a seat which can be altered in height. Wall-bars add further to converting the pool into a water gymnasium.

Further progress of the patient is supervised in the "dry" gymnasium, and particular emphasis is laid on simple home exercises. Furthermore, a list of home tips for the handicapped is available, and it is hoped that at an early date a series of demonstrations of various "aids" will be arranged.

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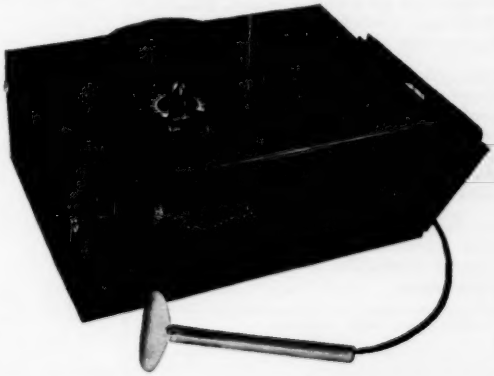

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MEETINGS OF INTEREST TO THOSE IN THE FIELD OF PHYSICAL MEDICINE AND REHABILITATION

In this column will be published information about meetings of interest to those in the field of physical medicine New data should be sent promptly to the office of the ARCHIVES, 30 North Michigan Avenue, Chicago 2, Illinois.

American Congress of Physical Medicine. — 30th Annual Session, The Roosevelt, New York, New York, August 25, 26, 27, 28, 29, 1952. Walter J. Zeiter, M.D., Chairman, Convention Committee, 30 North Michigan Ave., Chicago 2.

New York Society of Physical Medicine. — Meetings, first Wednesday. Madge C. L. McGuinness, M.D., Secretary, 48 E. 62nd St., New York 21, N. Y.

The National Society for Crippled Children and Adults, Inc. — 1952 annual convention, Fairmont Hotel, San Francisco, October 26, 27, 28 and 29, 1952. Lawrence J. Linck, Executive Director, 11 South La Salle Street, Chicago 3.

American Occupational Therapy Association. — Annual Convention, August 9-16, 1952, Milwaukee, Wisconsin, Hotel Schroeder. Marjorie Fish, OTR, Executive Director, 33 West 42nd Street, New York 18, N. Y.

International

International Congress of Physical Medicine (1952). London, July 14 to 19, 1952. Applications for the provisional program should be addressed to the Honorary Secretary, Dr. A. C. Boyle, International Congress of Physical Medicine (1952) 45, Lincoln's Inn Fields, London, W.C. 2.

PHYSICAL MEDICINE AND REHABILITATION **

The following services are approved by the Council on Medical Education and Hospitals, and the American Board of Physical Medicine and Rehabilitation. Residencies in this specialty have been approved without specifying the number of years for which they are accredited. The Board will give appropriate credit for training in these hospitals on an individual basis.

Hospitals, 43 Assistant Residencies and Residencies, 87

Name of Hospital	Location	Chief of Service	Inpatients Treated	Number of Treatments	First Year Residencies Offered*	Total Residencies Offered*	Beginning Stipend (Month)
UNITED STATES ARMY							
Letterman Army Hospital★	San Francisco	R. C. Psaki	3,330	74,961	—	—	—
Fitzsimons Army Hospital★	Denver	H. B. Luscombe	19,403	258,913	1	4	—
Army Medical Center★	Washington, D. C.	J. H. Kuitert	6,755	263,456	3	5	—
VETERANS ADMINISTRATION							
Veterans Admin. Hospital★[1]	Long Beach, Calif.	R. N. Nyquist	10,922	195,816	1	2	—
†Veterans Admin. Hospital [1]	Fort Logan, Colo.	F. J. Fricke	907	36,326	—	—	—
Veterans Admin. Hospital [1]	Hines, Ill.	L. B. Newman	5,665	450,711	—	—	—
Veterans Admin. Hospital [1]	Wadsworth, Kans.	L. Blau	3,169	192,760	—	—	—
Veterans Admin. Hospital [1]	Framingham, Mass.	F. Friedland	7,000	210,000	1	3	—
Veterans Admin. Hospital [1]	Jefferson Bks., Mo.	E. H. Weissenb'g	2,216	77,491	1	1	—
Veterans Admin. Hospital [1]	New York City	A. S. Abramson	13,819	314,026	3	9	—
Veterans Admin. Hospital [1]	Cleveland	H. T. Zankel	6,414	81,929	1	1	—
†Veterans Admin. Hospital	Portland, Ore.	E. W. Fowlks	4,954	110,429	1	1	—
†Veterans Admin. Hospital [1]	Aspinwall, Pa.	S. Machover	2,516	106,131	—	1	—
Veterans Admin. Hospital★[1]	Houston, Tex.	B. L. Boynton	1,582	6,894	1	1	—
NONFEDERAL							
Los Angeles County Hospital★[1]	Los Angeles	E. Austin	—	91,836	—	1	166
White Memorial Hospital★	Los Angeles	F. B. Moor	195	—	1	1	120
University of Colorado Medical Center Colorado General Hospital★[1]	Denver	H. L. Dinken	2,580	45,876	1	2	75
State of Connecticut Vet. Home & Hosp.	Rocky Hill, Conn.	—	—	—	3	3	—
Emory University Hospital★	Emory Univ., Ga.	R. L. Bennett	1,719	10,473	1	1	50
Georgia Warm Springs Foundation	Warm Springs, Ga.	R. L. Bennett	973	104,401	1	3	250
Cook County Hospital★[1]	Chicago	D. Kobak	7,501	37,516	—	—	—
Michael Reese Hospital★[1]	Chicago	C. O. Molander	2,254	19,589	1	1	25
Northwestern University Medical Center	Chicago	—	13,590	40,962	—	—	—
Research and Educational Hospitals★[1]	Chicago	H. W. Kendell	5,688	11,769	1	3	85
University of Kansas Medical Center★[1]	Kansas City, Kans.	D. L. Rose	2,456	42,310	1	1	100
Massachusetts General Hospital★	Boston	A. L. Watkins	2,925	31,999	0	9	41.66
University Hospital★	Ann Arbor, Mich.	—	—	—	—	—	—
University of Minnesota Hospital★[1]	Minneapolis	M. Knapp	20,409	29,436	4	4	—
Mayo Foundation	Rochester, Minn.	F. H. Krusen	—	—	2	6	135
Barnes Hospital★	St. Louis	S. Mead	9,759	9,759	0	1	—
†Bellevue Hosp., Div. III, N. Y. Univ.★[1]	New York City	H. A. Kusk	4,058	116,705	—	7	80
Goldwater Memorial Hospital★	New York City	M. Dacso	733	50,706	1	2	80
Hospital for Joint Diseases★[1]	New York City	J. Weiss	—	94,631	1	1	40
Hospital for Special Surgery	New York City	K. G. Hansson	20,806	40,810	1	1	160
Mount Sinai Hospital★[1]	New York City	W. Bierman	11,942	36,970	1	1	50
New York City Hospital★[1]	New York City	F. K. Safford, Jr.	1,138	41,048	1	1	130
†Presbyterian Hospital★[1]	New York City	W. B. Snow	25,865	103,546	1	1	200
St. Luke's Hospital★[1]	New York City	R. Muller	900	98,954	1	1	60
†Rehabilitation Hospital	W. Haverstraw, N. Y.	M. Haberman	5,868	408,371	1	1	225
Cleveland Clinic Hospital [1]	Cleveland	W. J. Zeiter	17,052	38,475	1	4	—
Hospital of the University of Pa.★[1]	Philadelphia	G. M. Piersol	1,836	25,639	0	1	—
Philadelphia General Hospital★[1]	Philadelphia	A. A. Martucci	2,827	23,733	1	1	75
Medical College of Virginia—Hosp. Div.★[1]	Richmond, Va.	W. J. Lee	4,575	40,327	—	—	46.50

The star (★) indicates hospital approved for intern training.
The dagger (†) indicates temporary approval.
[1] Residencies open to women.
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Medical Field Service School, Brooke Army Medical Center, San Antonio, Texas	Charles D. Shields, Lt. Col., M.C. Agnes P. Snyder, Major, WMSC	e	49 wks.	Mar.-Sept.	26	None	Certificate
Fitzsimons Army Hospital, Denver	H. B. Luscombe, Col., M.C.	Affiliated with Medical Field Service School					
	Olena M. Cole, Maj., WMSC						
Letterman Army Hospital, San Francisco, California	Raoul C. Psaki, Lt. Col., M.C. Emma Harr, Maj., WMSC	Affiliated with the Medical Field Service School					
Walter Reed Army Hospital, Washington, D. C.	J. H. Kuitert, Lt. Col., M.C.	Affiliated with Medical Field Service School					
	Brunetta Kuehlthau, Maj., WMSC						
Nonfederal							
Childrens Hospital, Los Angeles*	S. S. Matthews, M.D.	a-b-d	14 mos.	Sept	14	$300	Cert. or Degree
	Mrs. Mary J. Dodge						
College of Medical Evangelists, Los Angeles*	F. B. Moor, M.D.	a-b-c	15 mos.	Sept	16	$300	Cert. or Degree
	R. Wm. Berdan						
University of Southern California, Los Angeles*	C. L. Lowman, M.D.	a-b-d	14 mos.	Sept	16	Univer.	Certificate
	Charlotte W. Anderson	f	4 yrs.	FebSept	6	Univer.	Cert. & Degree
University of California School of Medicine, San Francisco*	Lucile Eising, M.D.	d	12 mos.	Sept	16	$220[3]	Cert. or Degree
	Margery L. Wagner						
Stanford University, Stanford University, Calif.*	W. H. Northway, M.D.	a-d-e	12 mos.	Varies	29	$690	Certificate
	Lucille Daniels	f	4 yrs.	Sept	16	$220 qr.	Degree
University of Colorado Medical Center, Denver*	Harold Dinken, M.D.	a-b-d	12 mos.	Sept	12	$208[3]	Cert. or Degree
	Mary Lawrence						
Northwestern University Medical School, Chicago	E. D. W. Hauser, M.D.	a-b-d	12 mos.	Oct	16	$450	Certificate
	Gertrude Beard						
State University of Iowa College of Medicine, Iowa City*	W. D. Paul, M.D.	e	12 mos.	Sept	20	$200	Certificate
	Olive C. Farr						
University of Kansas Medical Center, Kansas City, Kan.*	D. L. Rose, M.D.	d	12 mos.	FebSept	3	$40[2]	Certificate
	Ruth G. Monteith	f	4 yrs.	FebSept	9	$40[2]	Degree
Simmons College, Boston	W. T. Green, M.D.	a-e	16 mos.	Sept	24	College	Diploma
	Shirley M. Cogland	f	4½ yrs.	Sept			Degree
Boston University College of Physical Education for Women, Sargent College, Cambridge, Mass.	Kenneth Christophe, M.D.	c-d-e-f	1-2-4 yrs.	Sept	30	Univer.	Cert. or Degree
	Adelaide L. McGarrett						
Bouve-Boston School in affiliation with Tufts College, Medford, Mass.	Howard Moore, M.D.	f	4 yrs.	Sept	16	$550	Dipl. & Degree
	Constance K. Greene						
University of Minnesota, Minneapolis*	F. J. Kottke, M.D.	c	2 yrs.	Sept	20	$126	Degree
	Ruby Green Overmann						
Mayo Clinic, Rochester, Minn.*	E. C. Elkins, M.D.	a-b-c	2 yrs.	Sept	28	$250	Certificate
	Harry Keown						
St. Louis University, Division of Health and Hospital Services, St. Louis*	A. J. Kotkis, M.D.	f	4 yrs.	JanSept	12	$175	Degree
Washington University School of Medicine, St. Louis*	Sister Mary Imelda					Semes.	
	Sedgwick Mead, M.D.	e	2 yrs.	Sept	16	$450 1st yr.[3]	Degree
	Beatrice F. Schulz					$325 2d yr.[3]	
Albany Hospital, Albany, N. Y.	J. W. Ghormley, M.D.	a-b-d	12 mos.	Sept	6	$300	Certificate
	Catharine Graham	f	4 yrs.	Sept		$500	Degree
Columbia University College of Physicians and Surgeons, New York City*	W. B. Snow, M.D.	a-c-e	1-2 yrs.	Sept	50	$650 (1 yr.)	Cert. or Degree
	Floy L. Pinkerton					$1,200 (2 yrs.)	
New York University School of Education, New York City*	G. G. Deaver, M.D.	a (+1 yr. coll.) b-d	12 mos.	Sept	40	$760	Cert. & Degree
	Elizabeth C. Addoms						
Duke University, Durham, N. C.*	L. D. Baker, M.D.	a-b-d	15 mos.	Oct	12	$350	Certificate
	Helen Kaiser						
Cleveland Clinic Hospital, Cleveland*	Walter J. Zeiter, M.D.	a-b-c	12 mos.	Oct	12	$200	Diploma
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D. T. Watson School of Physical Therapy, Leetsdale, Pa.*	Jessie Wright, M.D.	a-b-d	12 mos.	Oct	26	$300	Diploma
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Division of Physical Therapy of the School of Auxiliary Medical Services of the University of Pennsylvania, Philadelphia*	G. M. Piersol, M.D.	e	12 mos.	FebSept	32	$600	Certificate
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	Mary Elizabeth Kolb						
Baruch Center of Physical Medicine and Rehabilitation, Medical College of Virginia, Richmond*	W. J. Lee, M.D.	a-b-d	12 mos.	Sept	52	$300[2]	Diploma
	Susanne Hirt	f	4 yrs.	Sept			Degree
University of Wisconsin Medical School, Madison*	H. D. Bouman, M.D.	a-b-d	12 mos.	Sept	22	$60	Certificate
	Margaret A. Kohll	f	4 yrs.	FebSept	20	Semes.[3]	Cert. & Degree

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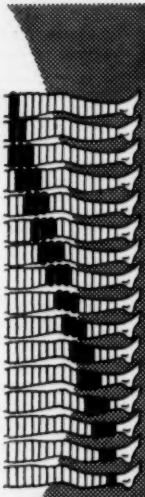

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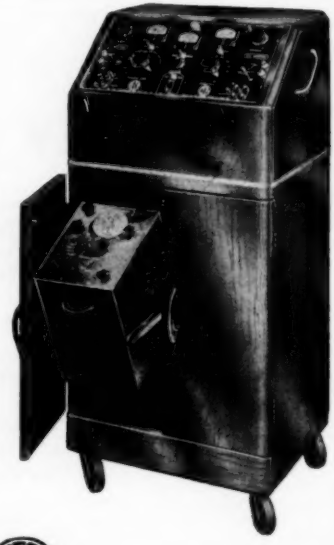

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[1]Handbook of Physical Medicine and Rehabilitation, S. L. Osborne, p. 245. Published for the A.M.A. The Blakiston Co., Philadelphia, 1950.

[2]Svien, H. J., and Dodge, H. W., Jr.: Peripheral Nerve Injuries, GP 5:57 (Mar.) 1952.

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